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Farmer Cooperative Theory: Recent Developments

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Farmer Cooperative Theory: Recent Developments

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Since 1980, agricultural economists have begun to reexamine fundamental issues in the theory of agricultural cooperation. These include the basic nature of farmer cooperation; the theoretical benefits and limits of cooperative enterprise; and the implications of these for cooperative members, managers, and public policy. Analysts have extended previous models of the cooperative as a type of business firm in order to analyze the impact of large cooperatives on market performance. They have also developed new models to analyze how cooperatives attempt to serve the divergent interests of different participants, such as managers and different classes of farmers. This report describes and evaluates recent theoretical developments, outlines remaining areas of conflict and gaps in the theory of agricultural cooperation, and discusses topics for future research. It concludes that one of the most promising areas for current research may be in testing hypotheses arising from current theoretical work.

Keywords: Cooperative theory, public policy, market coordination, economic performance, finance, pricing, member control.

Preface

By the late 1970's, it had become clear to the cooperative community that existing theories of farmer cooperation had failed to address adequately many of the critical issues facing farmer cooperatives. The environment in which these organizations and their patron-members operated had grown much more complex than in the 1950's and 1960's, when most of the previous theories about the behavior of farmer cooperatives were developed. Hence, there was a need for new theoretical work to guide empirical, problem-oriented research aimed at finding ways to improve performance of individual cooperatives, and the cooperative system as a whole.

Beginning in 1980, the Agricultural Cooperative Service (ACS) in the U.S. Department of Agriculture played a critical role in fostering a new round of work on cooperative theory by funding research at several land-grant universities. Some results of that research have already appeared in the report, *Cooperative Theory: New Approaches*, edited by Jeffrey S. Royer (ACS Service Report No. 18). This report is companion to the earlier publication, and attempts to synthesize the results of the ACS-sponsored "Cooperative Theory Project" as well as other recent developments in the theory of farmer cooperation.¹

Many people provided helpful reviews of this report, including James Shaffer, Larry Hamm, V. James Rhodes, Ronald Cotterill, Jeffrey Royer, Michael Turner, Hugh Moore, Kenneth Duft, David Cobia, and David Holder. Any remaining errors of fact or interpretation are solely those of the author.

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The 1980's witnessed a resurgence of research by agricultural economists on the theory of agricultural cooperation. The renewed interest in cooperative theory resulted from the recognition that existing theories failed to address many of the challenges facing agricultural cooperatives today. These challenges include the need for cooperatives to compete with very large, often conglomerate, investor-owned firms (IOF's); the necessity of raising large amounts of equity capital to capture economies of size; the dilemmas in serving a highly heterogeneous group of members, whose interests sometimes conflict; and the difficulties of dealing in increasingly risky markets. In addition, the growth and consolidation of cooperatives raised many questions for public policy, such as whether large cooperatives posed antitrust problems; whether cooperatives could improve market coordination, thereby substituting for Federal income- and price-support programs; and whether large, multi-division cooperatives really behaved any differently from IOF's.

In attempting to address these issues, economists have extended previous models that viewed the cooperative as a firm; developed new approaches that model the behavior of cooperatives in highly concentrated industries ("the planning sector"); analyzed the cooperative as a coalition of various participants, such as farmers, managers, board members, and input suppliers; and modeled the cooperative as a set of explicit and implicit contracts among these participants. In carrying out these analyses, theorists have adapted many approaches originally developed for the analysis of investor-owned firms, such as applications of game theory, agency theory, behavioral theories of the firm, and the theory of contestable markets.

The recent work has shown that the structure of cooperatives offers them opportunities and creates challenges for them different from those present in IOF's. Consequently, cooperatives may perform differently than IOF's, both as individual economic entities and in their effect on the wider economy. Whether an individual cooperative realizes its potential for improving economic performance and farmer welfare, however, depends critically on the co-op's structure and practices.

The theoretical work has also demonstrated that setting operational goals for a cooperative involves striking delicate balances. For example, a co-op needs to balance the goal of increasing its net margin with the goal of offering members attractive prices. Attempting simply to maximize the cooperative's net margin does not maximize members' welfare, nor does focusing solely on providing members with favorable prices. Similarly, when the cooperative has a heterogeneous membership, the co-op needs to balance benefits among various members to preserve the membership base. In some instances, differential pricing of goods and services to members is necessary to prevent those with better market opportunities from abandoning the cooperative, which could leave the remaining members worse off. Striking such delicate balances is one of the key responsibilities of the board of directors.

Another area of theoretical work has been the implications of the patron-owner relationship for cooperative finance. The lack of ability to "float stock" constrains the equity base of cooperatives and prevents the emergence of a secondary market for cooperative equity certificates. The absence of such a

market has a number of implications for cooperative investments and governance, including the reluctance of cooperatives to undertake projects with long gestation periods and the need for cooperatives' boards of directors to play a much more active role in the governance of their organizations than do IOF boards of directors.

Theory also suggests that potential exists for improving the performance of the entire cooperative system, not just individual cooperatives. For example, in some cases there is theoretical justification for more collaboration and less competition among cooperatives. Such collaboration could reduce total system costs and improve returns to farmers. But both theoretical work and common observation highlight several factors that can block such collaboration, such as the vested interests of current managers, patron-owners, and board members, and the belief by some members that competition is the only way of ensuring control over management. Hence, any move to increase collaboration among cooperatives will have to address these issues. The theoretical work also shows that in some circumstances cooperative members would be better off taking collective action via the cooperative, but that incentives exist for them to behave independently, acting as free riders. An example is the lack of patron commitment to a cooperative that is acting as a competitive yardstick. To capture the potential for improved coordination, cooperatives need to develop mechanisms to increase member commitment, such as contracts with members that have significant penalties for nonperformance. The development of such mechanisms needs to be coupled with actions aimed at strengthening member control, however; otherwise, such actions might simply remove membership pressure on the management and the board to perform their duties effectively.

The recent theoretical research also reaffirms that there are often valid justifications for public policies to support cooperatives, particularly because of their effects on competition in highly concentrated markets and their potential to improve market coordination. The recent work cautions, however, that the public should not grant *carte blanche* to cooperatives, as certain types of cooperative structures may behave similarly to an IOF conglomerate. In particular, theory suggests that cooperatives that follow a closed membership policy and make heavy use of unallocated retained earnings are more likely to pose antitrust problems.

Areas warranting additional theoretical research include further analyses of cooperative-IOF joint ventures and analyses of how cooperatives can effectively collaborate to counterbalance increasing IOF concentration in certain segments of the agricultural economy. In addition, the theoretical work outlined in this report generates many new hypotheses that deserve empirical investigation. Testing these hypotheses may be one of the most fruitful areas for further cooperative research.

Farmer Cooperative Theory: Recent Developments

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WHY STUDY COOPERATIVE THEORY?

Recently the CEO of a major California cooperative spoke on “Agricultural Cooperatives: Are They Still Relevant?” (Allewelt). The question is heretical to many in the cooperative community, yet it is one that is increasingly heard. The answer ultimately depends on what, if anything, is unique about farmer cooperatives, and what advantages they offer member-patrons in dealing with today’s complex and rapidly changing business environment.

Cooperative advocates have discussed their unique features ever since the days of the Rochdale pioneers. In the 1920’s, two schools of thought developed in the United States regarding the justification for, and function of, farmer cooperatives. One school, identified with Aaron Sapiro, argued that the major function of farmer cooperatives was to unify farmers on a commoditywide basis so that they could exert market power and raise total returns to agriculture. By contrast, followers of Edwin Nourse contended that cooperatives should function as “competitive yardsticks.” They should not try to monopolize commodity markets but simply add enough competition to the system to give farmers a basis on which to judge the performance of investor-owned agribusinesses. Since the 1940’s, academicians, particularly economists, have drawn on Sapiro’s and Nourse’s ideas as well as general economic theory to develop formal models of cooperatives’ behavior. These models highlight how the unique features of farmer cooperatives affect their business practices and examine the implications of those practices for patron-members and society at large.

Between the mid-1940’s and the mid-1960’s, cooperative theorists focused particularly on the nature of the relationship between the cooperative and its member-patrons and the implications of that relationship for how the cooperative priced its goods and services, for how those pricing and output decisions affected market competition, and for the appropriate rules for governing the cooperative. After the mid-1960’s, research on cooperative theory fell off

dramatically. The environment in which cooperatives and their members operated, however, continued to evolve rapidly, posing new problems and opportunities for cooperatives, many of which were not addressed by existing theories of farmer cooperation. In response to these new challenges, there has been a resurgence during the 1980’s of theoretical work on farmer cooperatives. A key element in this resurgence has been financial and intellectual support offered by the Agricultural Cooperative Service (ACS). Since 1980, researchers have explored the basic nature of farmer cooperation, the theoretical benefits and limits to cooperative enterprise, and the implications of these for cooperative members, managers, and public policy. This report describes and evaluates the recent theoretical developments; examines some of their implications for cooperative decisionmaking, management practices, and public policy; outlines remaining areas of conflict and gaps in the theory of agricultural cooperation; and discusses topics for future research.

Organization of the Report

Although this report briefly mentions some recent work by European theorists, it focuses primarily on the North American agricultural economics literature since 1980.² It also concentrates almost exclusively on the literature concerning agricultural marketing and supply cooperatives. It does not review the voluminous, and in many ways parallel, literature on the theory of the labor-managed firm (including the agricultural production cooperative) or on the theory of agricultural bargaining cooperatives (which is similar to the theory of labor unions) and mentions only briefly work on the theory of consumer cooperatives.³

Role of Theories and Economic Models

Before proceeding, it is useful to say a few words about the nature and purpose of economic theories and models. All models and theories of behavior are by definition abstractions and simplifications of reality. The purpose of a theory is to simplify the complexity of

Notes and references carried at end of text.

the real world so that the key elements determining how something works can be identified and the interrelationships among those elements can be understood.

The aim of cooperative theory is therefore to develop models that help us understand how cooperatives do or potentially could operate in the real world. Such models and theories have the ultimate purpose of aiding cooperative managers, directors, extension personnel, and those involved in establishing public policy toward cooperatives, in the process of problem solving. By outlining the relationships among key variables that help determine cooperative behavior and performance, theory can provide guidance in:

1. Assessing problems and opportunities facing cooperatives;
2. Developing and evaluating alternative strategies, such as different pricing arrangements; and
3. Anticipating probable outcomes of alternative courses of action.

Because all theories are by definition simplifications of reality, the test of the usefulness of a theory does not lie in whether the theory faithfully represents the real world, for no theory or model will or should. Rather, the tests of usefulness lie in whether the crucial elements of the behavior and relationships affecting the problem at hand have been correctly identified, whether important elements have not been assumed away, and whether extraneous elements have been ignored. (For more details, see Condon.) This implies that different models will assume different things away depending on what problem the model is built to address. Certain elements of reality may be crucial for particular problems but irrelevant to others. For example, models of a cooperative's pricing behavior are likely to differ depending on whether the cooperative has a dominant market share or whether it operates as a small firm in a large industry. Similarly, models may differ depending on whether the cooperative has a federated or centralized structure. Although conceptually one can imagine one grand theory of cooperation that would address all issues faced by all types of farmer cooperatives, such a theory would likely be so complex as to negate the main advantage of theory—the simplification of reality to facilitate analysis. Therefore, rather than to seek a single model of cooperatives' behavior, it is more realistic to seek *several* models, each addressing different aspects. In this perspective, the different

theoretical approaches outlined in this report should be viewed as largely complementary rather than competing.

DEVELOPMENTS IN COOPERATIVE THEORY THROUGH 1980

Economists studying cooperative theory through 1980 tended to view the farmer cooperative in three distinct ways: (1) as a form of vertical integration by otherwise independent firms, (2) as an independent business enterprise, which could be analyzed as a variant of the investor-owned firm (IOF), and (3) as a coalition of firms, in which there was "a revocable substitution of collaboration for independent competition" (Sosnick, p. 2; Staatz, 1984). From the 1940's through the early 1960's, much of the debate in cooperative theory focused on whether cooperatives represented purely a form of vertical integration by farmers, that is, simply an extension of the member firms, or whether cooperatives could legitimately be analyzed as organizations having scope for decisionmaking independent of their member firms. This debate was often phrased in terms of whether cooperatives were really "firms." While it may seem odd that economists would debate whether to call multimillion dollar organizations "firms," the real debate wasn't simply one of terminology. Rather, it was over whether management of the cooperative simply implemented the member-patrons' desires or whether it pursued goals of its own, causing the cooperative to act as a firm that was in some ways independent of the members.

The Cooperative as a Form of Vertical Integration

As far back as 1922, advocates of farmer cooperatives such as Nourse were arguing that farmer cooperatives were simply extensions of the members' farm firms. Emelianoff, in 1942, was the first to analyze formally the cooperative as a form of vertical integration. He argued that because a cooperative operated at cost, it did not incur profits or losses itself; only its member firms incurred profits or losses. Therefore, the cooperative was not an acquisitive unit and hence not a firm. Emelianoff's views were further developed by Robotka and formalized into a model of cooperative output and pricing decisions by Phillips.

Phillips argued that the cooperative simply represented a jointly owned plant operated by

independent member firms. Throughout his analysis, Phillips assumed that member firms dealt exclusively with the cooperative. Therefore, he did not address the broader question of how a firm determines its degree of participation in the cooperative:

“When a group of individual firms form a cooperative association, they agree mutually to set up a plant and operate it jointly as an integral part of each of their individual firms (or households in the case of a consumer cooperative). The cooperative has no more economic life or purpose apart from that of the participating economic units than one of the individual plants of a large multi-plant firm” (Phillips, pp. 74-75).

Two separate issues need to be distinguished: Whom was the cooperative set up to serve and how does it make its output and pricing decisions? Phillips did not distinguish these issues as separate, concluding that since the cooperative was set up solely to serve its members, its decisions could be modeled as if the cooperative were one plant of a multiplant firm. Many years earlier economists had developed rules for how an IOF operating several different plants should set output levels in each plant to maximize profits, and Phillips argued that the optimal output and pricing rules for the members of a cooperative could be determined by simply extending this basic theory.

Phillips’ proposed pricing and output rule involved all the member firms producing at a point where their marginal costs of production were equal to the marginal revenue the cooperative received from an additional unit of output. Among the problems with this proposed solution is that members would not have an incentive to produce at that level if the cooperative plant faced either increasing or decreasing marginal costs. In those cases, the marginal cost faced by the member would diverge from that faced by the cooperative as a whole. For example, if a processing cooperative faced increasing marginal costs, the per-unit margin would fall for each additional unit of raw product the cooperative processed. The individual member would only take into account how this decrease in per-unit margins affected his or her profits, not those of the other members of the cooperative and hence would have an incentive to expand production beyond the optimum level for the cooperative as a whole. The member would therefore not bear the full marginal cost of his or her actions on the cooperative. (For details, see Sexton, 1984b, pp. 64-69.) Furthermore, following the Phillips rule requires that each member know the equilibrium outputs of all other members to determine how much to produce.

Phillips argued that to achieve an optimum level of production, each member must share the benefits and costs of the joint plant in direct proportion to the member’s share of the total business conducted through the cooperative. Similarly, the benefits and costs of individual departments should be allocated among the members in direct proportion to their use of those departments (pp. 76-78).

Such a view seems consistent with the cooperative principle of service at cost. It assumes, however, that:

1. All costs of cooperative activity should be borne by members because they accrue all the benefits of that activity,
2. All the benefits from one department of a cooperative accrue solely to the direct users of that department,
3. All activities of the cooperative in one time period generate benefits only in that time period, and
4. Overhead costs can be allocated among departments in a nonarbitrary manner.

In raising the issue of sharing costs and benefits of the cooperative in proportion to use, Phillips helped spark the debate over “equal versus equitable treatment” of members of a cooperative. The issue has become more pointed in recent years with the growing diversity of cooperative members. Phillips clearly came down on the side of those who advocated differential treatment of members based on their degree of patronage.

In keeping with his “theory of proportions,” Phillips also advocated that voting in cooperatives be proportional to patronage. He argued that since costs and benefits in cooperatives should ideally be distributed proportionately, the rule of one-person, one-vote in cooperatives “had no scientific basis” (pp. 86-87). The argument over proportional voting continues today, with some contending that it is necessary to put control of the cooperative in the hands of those who really use it. Others, however, see proportional voting as threatening the basic tenet of democratic control.

The Cooperative as a Firm

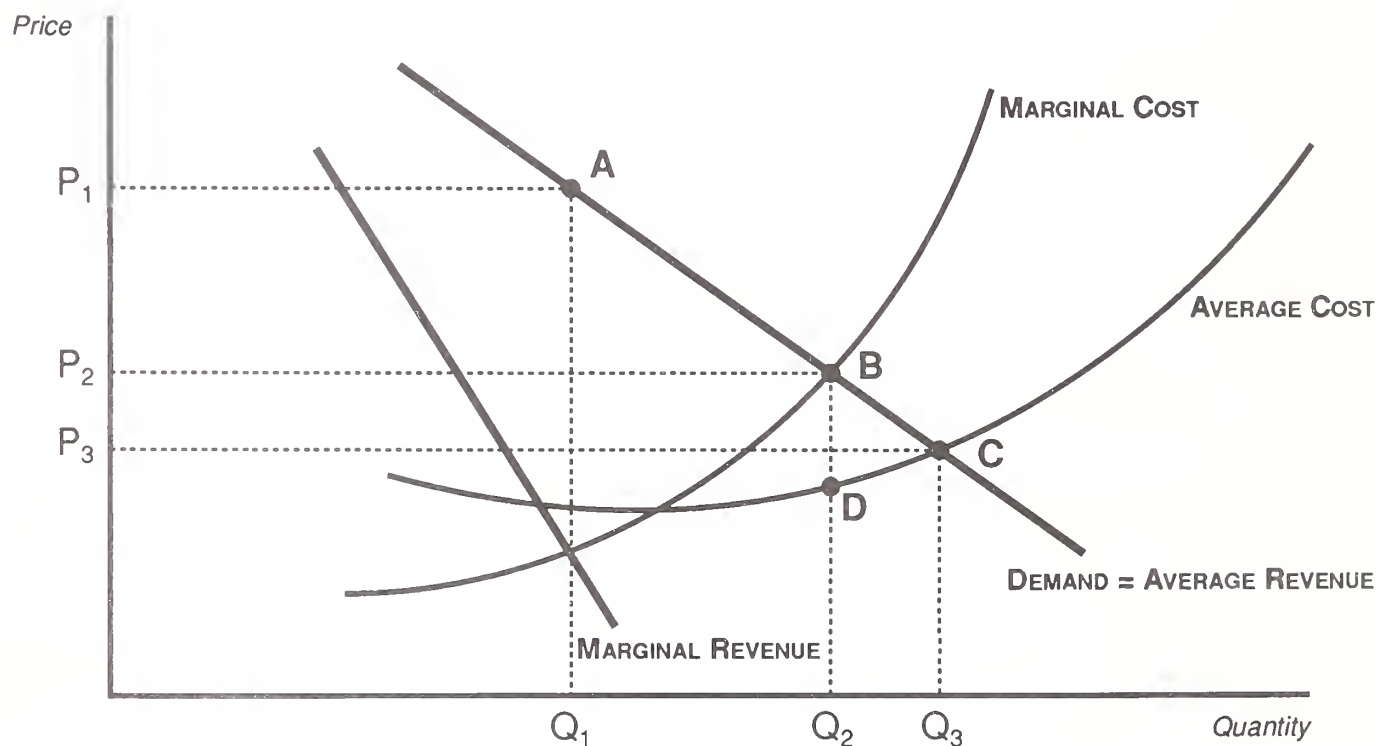
Stephen Enke, writing about consumer cooperatives in 1945, was the first to analyze the cooperative formally as a separate type of business firm. He pointed out that on a day-to-day basis the cooperative manager had to choose what to maximize (total sales, level of the patronage refund, profits, etc.).

Enke traced the consequences for the cooperative and for society as a whole of choosing alternative goals. Enke's work represented the beginning of a long and often muddled debate about what cooperatives should or did seek to maximize.⁴ Often this debate confused what was *desirable* with what was *feasible* and did not distinguish shortrun outcomes from longrun outcomes.

Enke analyzed the situation of a cooperative that was operating either as a monopolist or in monopolistic competition (fig. 1). In other words, the cooperative had some influence over the price it could charge for its goods and services. (The cooperative's ability to vary its prices without losing all of its patrons is indicated by the downward-sloping demand curve in figure 1.) The cooperative also had some fixed investments, such

as a store of a given size.⁵ Enke concluded that in this situation the welfare of both the cooperative members and society as a whole was maximized if the cooperative manager sought to maximize the sum of the cooperative's "profits" (producer surplus) and the members' benefits from lower prices (consumer surplus).⁶ This was achieved at the point where the cooperative's marginal cost curve intersected its demand curve (point B). At that point, the decrease in member-patron benefits that would result from the fall in the cooperative's "profits" from a unit increase in output would be just offset by the increase in members' benefits (as measured by consumer surplus) that would result from the lower prices that accompanied expanded output (Cotterill, pp. 188-90).

Figure 1 — Alternative Shortrun Goals for a Supply or Consumer Cooperative Operating In Monopolistic Competition



Point A — Maximization of cooperative's profit (analogous to IOF's goal of profit maximization)

Point B — Maximization of sum of consumer and producer surpluses (Enke's solution)

Point C — Minimization of member price consistent with covering costs ("zero surplus" solution — e.g., Helmberger-Hoos)

Source: Enke, p. 149. Similar figures are also presented in Kaarlehto (1956), p. 283; LeVay, p. 12; and Cotterill, p. 189.

Enke's model emphasized that to maximize member benefits, the cooperative manager had to balance the benefits members received as owners of a profitable enterprise with the benefits they received as patrons of an establishment that offered favorable prices. Going too far in one direction or the other, that is, running the cooperative in a manner that simply maximized profits as a separate entity or running it in a way that simply minimized prices to members, would reduce total member benefits. Enke's work thus emphasized an important implication of the unique owner-patron relationship in cooperatives—the need to balance benefits derived as stockholders with those derived as patrons.

There is a problem, however, with the managerial goal that Enke proposed: Under most circumstances members would not want to patronize the cooperative at the level that would maximize total member benefits. At point B in figure 1, the cooperative would generate a per-unit net margin equal to BD. If this were rebated to members in proportion to their patronage, they would likely interpret the refund as a reduction in the price, which would give them an incentive to expand their patronage beyond the welfare-maximizing point B. If the cooperative does not impose some limit on patronage, the only stable patronage point (equilibrium) is point C, at which point the cooperative earns no net margin. Point C, however, is not the welfare-maximizing point. Point B would be a stable equilibrium only if the members regarded the patronage refund as a windfall gain or if the cooperative faced constant marginal costs of production. In the latter case, the marginal cost and average cost curves would coincide, as would points B and C.⁷

Enke's work initially was ignored by theorists working in the area of agricultural cooperatives. Most of the early work on the agricultural cooperative as a firm emerged in reaction to the writings of Emelianoff, Robotka, and Phillips, which generated much critical discussion in professional journals. Critics of the "cooperatives as vertical integration" approach attacked the narrow definition of the firm used by Emelianoff, Robotka, and Phillips, and hence the implied locus of decisionmaking within the cooperative, and the existence and stability of the cooperative equilibrium posited by Phillips.

Emelianoff and his followers had argued that because cooperatives do not accumulate capital and seek profit for their own account, they did not meet the classical definition of a firm. The critics countered by describing the cooperative as a "going concern," an

entity to which participants delegate entrepreneurial functions to gain the advantages of joint action. These authors argued that such revocable delegation of decisionmaking authority resulted in hired managers making most of the cooperative's day-to-day decisions. Managers pursued certain objectives (for example, maximizing the cooperative's net margins or sales), and the pricing and output decisions of the cooperative resulted from the pursuit of those objectives.

Helmberger and Hoos, whose work became the standard model in cooperative theory for nearly 20 years, argued that the agricultural cooperative could be modeled as a separate firm, using tools from the standard neoclassical theory of the investor-owned firm.

Helmberger and Hoos explained that the theory of the profit-maximizing firm needed to be modified before it was applied to cooperatives because, the authors argued, cooperatives did not try to maximize their own profits but rather those of their farmer-members. Cooperatives did this by operating on a zero-profit basis and returning all their "surplus" (net margins) to the members. Helmberger and Hoos assumed that in an agricultural processing cooperative, the manager would try to maximize member benefits by maximizing the average per-unit cooperative surplus (or "pay price") to the farmer. For a supply cooperative, the analogous goal would be to minimize the price of the good or service sold by the cooperative, subject to meeting per-unit costs of production. This would be achieved by operating at point C in figure 1.

Helmberger and Hoos developed models of both shortrun and longrun behavior by an agricultural processing cooperative. In the shortrun model, the cooperative took the amount of output supplied by the members as given. In the longrun model, output could be varied depending on whether the cooperative adopted an open- or closed-membership policy. Hence, unlike Phillips, Helmberger and Hoos addressed the question of when it would be in the interest of current members to limit further membership in the cooperative. The general conclusion was that it would be in the interest of existing members to expand membership whenever expansion would allow the cooperative to capture economies of size, thereby reducing per-unit processing costs.⁸ On the other hand, if the cooperative were facing increasing marginal costs, expanding the volume moving through the plant would increase per-unit costs, and it would be in the interest of existing members to restrict membership to prevent this from happening.⁹

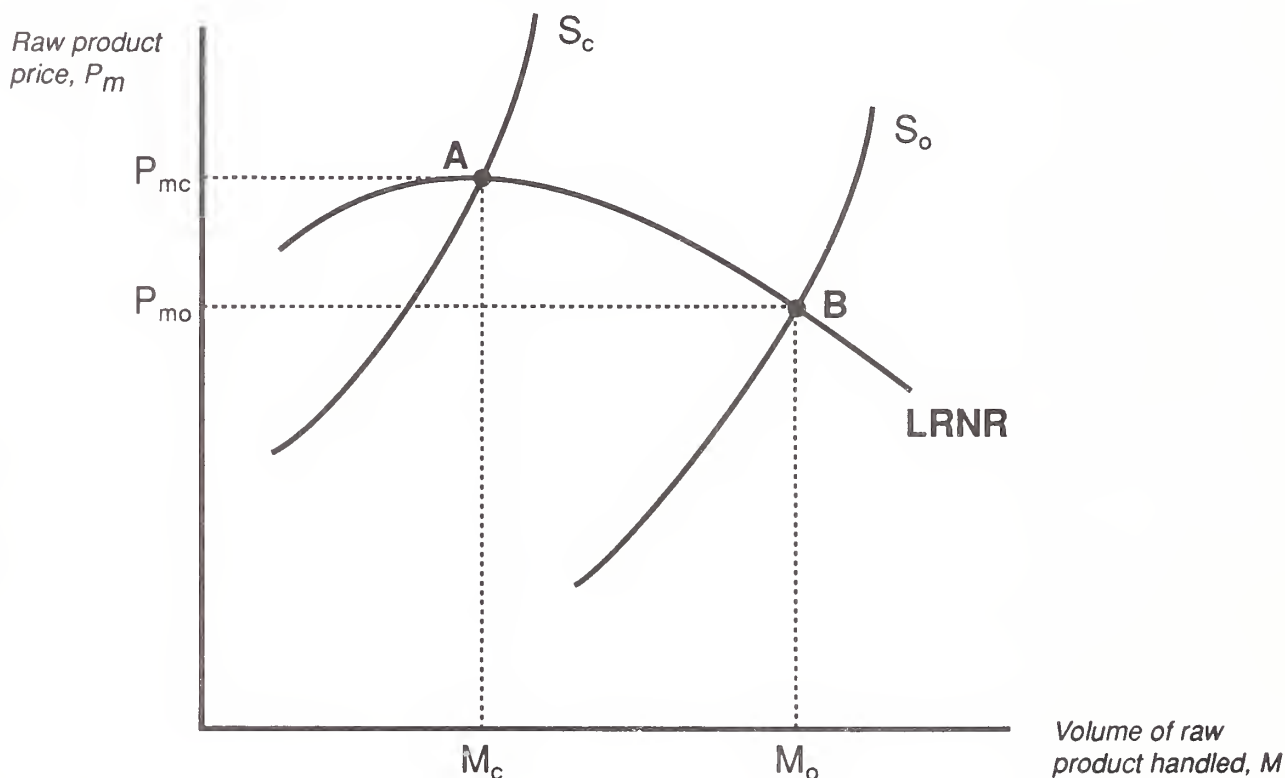
Even if it were in the interest of existing members to limit membership, others might want to join the

cooperative if it offered better prices than alternative market outlets. Hence, there can exist a potential conflict of interest between *existing* members and *potential* members of the cooperative. Helmberger and Hoos claimed that how this conflict was resolved depended on who controlled the cooperative. A cooperative dominated by a manager intent on expanding the volume of business might opt for expanding membership, while an organization firmly in the hands of farmer members might restrict it.

Although Helmberger and Hoos discussed this potential conflict, they did not attempt to model the bargaining process among members, the board, and management to settle the matter.

Helmberger and Hoos assumed that farmer-members acted as price takers, that is, an individual member could not influence the price the cooperative offered. Consequently, each farm-firm had a well-defined supply curve, which showed the amount of raw product the firm would be willing to sell to the

Figure 2 — Helmberger and Hoos Model of Cooperative Price and Output Determination In the Long Run—Open and Closed Membership



Source: Helmberger and Hoos (1962), p. 289.

Notes: S_c = Aggregate supply curve for closed-membership cooperative
 S_o = Aggregate supply curve for open-membership cooperative
 LRNR = Longrun net returns function

The net revenue function, as defined by Helmberger and Hoos, shows for each level of output of the cooperative the maximum per-unit amount (or "pay price") the cooperative can offer for the raw product and still cover all processing costs. The net revenue function is thus analogous to the cooperative's demand function for the raw product, based on the assumption that the cooperative strives to just break even.

cooperative at various prices. The individual firms' supply curves could be summed to yield an aggregate supply curve, showing how much raw product members would supply at different prices. The intersection of the cooperative's net revenue function with its supply function determined amount of output handled by the cooperative and the price paid to members for their raw product (fig. 2). In the long run, the equilibrium output and price depended on whether the cooperative followed an open- or closed-membership policy. A closed-membership cooperative would restrict membership so that the aggregate supply curve would intersect the longrun average net revenue curve at its maximum (P_{mc} in figure 2). If the cooperative followed an open-membership policy, members would enter as long as they found it profitable to do so, shifting the aggregate supply curve outward (to, say, S_0 in figure 2), resulting in a larger output and a lower raw-product price (P_{mo}) than would obtain in a closed-membership cooperative.

Helmberger and Hoos' assumption that farmer-members are price takers faces the same problem that arose with the Enke model, namely, whether a supply function for members of a marketing cooperative (or, equivalently, a demand function for members of a supply cooperative) can be unambiguously defined. If the initial price paid by the cooperative results in a net margin for the organization and if the margin is rebated to the members in proportion to their patronage, the members will probably interpret the rebate as part of the payment for their product. They will therefore have an incentive to expand their production further (Cotterill, p. 192). Only if the cooperative sets its prices in a way that results in a net margin equal to zero is the problem eliminated. Helmberger and Hoos assumed that the cooperative's manager knew its net revenue function, which specified the price the cooperative should pay for any given quantity of raw product to set the cooperative's net margin to zero and thus overcome the indeterminacy problem. It is highly questionable, however, whether cooperative managers really know in advance their firms' net revenue functions with such precision.¹⁰

The basic Helmberger-Hoos model was applied and extended in several ways during the 1960's and 1970's. Helmberger used the model to analyze how the presence of cooperatives would affect market outcomes in different market structures. His general conclusion was that a monopsonistic processing cooperative that followed an open-membership policy would generate

outputs and price levels closer to those that would prevail under perfect competition than would an IOF operating under the same conditions. This conclusion reinforced the view common in United States antitrust policy, at least through 1980, that cooperative "monopolies" did not threaten consumers if membership in the cooperative remained open because an open-membership cooperative cannot limit supply. Helmberger showed, however, that if the cooperative had a closed membership, the equilibrium output would be smaller and the equilibrium price would be higher than those obtained under an IOF. Hence, the question of open membership became critical in evaluating the impact of cooperative monopolies on the general public. Later, the basic Helmberger-Hoos model was extended to supply cooperatives (Youde, 1966, 1968), consumer cooperatives (Mather), and multiproduct processing cooperatives (see Helmberger, Campbell, and Dobson, pp. 558-59). A variant of the model served as a key part of Sunkist's successful defense against charges that the cooperative had illegally monopolized the California and Arizona citrus market in the late 1970's (Mueller, Helmberger, and Paterson).

A distinguishing feature of the Helmberger-Hoos approach was its assumption that the cooperative pursued a single objective. The model did not address how that goal was set. Rather, it simply assumed that the goal had been set and that once set, all the cooperative's resources were devoted to achieving it. Hence, the model did not try to analyze conflict within the cooperative about what the goal(s) of the organization should be.

Most theorists of the 1960's and early 1970's continued to base their models on this sort of centralized goal setting, although not all agreed with Helmberger and Hoos on what the cooperatives were trying to maximize. Most authors also continued to assume, as did both Phillips and Helmberger-Hoos, that all members faced similar if not identical cost functions, and hence there would be little conflict among the members about what goals the cooperative ought to pursue. The most ambitious attempt to build a general model of the cooperative as a firm that maximizes a single objective was the work of Carson, who presented a model of a "generalized welfare-maximizing firm" (or "G-firm"). This firm maximized a "generalized welfare function," which is basically a weighted sum of the "utility" (well-being) of the firm's stockholders. Because stockholders were free to buy and sell goods and services to and from the firm, farmer cooperatives, consumer cooperatives, the investor-owned firm, and

the worker-managed firm each represented a special case of the G-firm.

The Cooperative as a Coalition

Early models of the farmer cooperative as a form of vertical integration portrayed a very diffuse decisionmaking process within the organization. The cooperative as such made no decisions; only the individual member-firms made decisions. In contrast, most models of the "cooperative as a firm" developed in the 1960's and early 1970's saw decisionmaking in the cooperative as being completely centralized, presumably in the hands of the manager. Both types of models generally assumed a homogeneous membership and thus abstracted from intraorganizational goal conflicts. By doing so, these models could show that the maximizing activities of the individual farmer-members or of the cooperative's manager led to a unique and optimum (in terms of member welfare) set of prices and outputs for the cooperative.

As early as the 1950's, however, several authors (for example, Kaarlchto, Ohm, Trifon) pointed out that heterogeneity of the membership, differences of opinion between the membership and the management over the appropriate goals for the organization, information costs, and the nature of the collective action itself could each prevent such a stable outcome. In these situations, the cooperative's behavior would result from a bargaining process that reflected the relative power of the different participants. These authors argued that the cooperative should be viewed as a coalition of participants (different groups of farmers, management, board members, input suppliers, lenders, and nonmember customers), each of whom had its own objectives and who participated in the organization as long as it felt its objectives were being met.

Authors who have viewed the cooperative as a coalition have focused on situations in which conflicts could arise (1) among farmer-members of the cooperative and (2) between the farmer-members and the other participants in the cooperative, such as management. Authors who addressed interfarmer conflicts (such as Kaarlchto, Ohm, Trifon, and Pichette) focused primarily on situations in which individual members did not bear the full marginal cost or receive the full marginal return for their actions and hence had an incentive to act in ways that were inconsistent with the longrun welfare of the cooperative or of some of its members. This was often reflected in conflicts between current and potential members over whether to expand

membership in the cooperative, an issue also touched upon by Helmberger and Hoos. Conflicts between farmer-members and other cooperative participants, such as management, have been more widely discussed by European theorists (see Eschenburg and Ollila) than by their North American counterparts (an exception is Perrault). Both groups of authors have focused on the types of outcomes likely to be generated by the bargaining processes necessary to maintain the cooperative coalition. Their work presaged some of the more recent theoretical work discussed below.

RECENT DEVELOPMENTS IN COOPERATIVE THEORY

Renewed interest in North America in the theory of farmer cooperation grew out of the perceived inadequacy of existing theory to address many of the issues facing cooperatives. These issues arose largely because of changes in the market environment facing cooperatives and in the structure of the cooperatives themselves.

Reasons for the Resurgence

Growth in the size of major entities in the economy (firms, labor unions, etc.) led to renewed interest in the role that cooperatives play in concentrated markets, particularly when the cooperatives themselves are very large. Some of the questions that arose included whether farmer cooperatives could effectively compete with multinational conglomerates, especially given cooperatives' constraints on raising equity capital; whether large cooperatives themselves posed antitrust problems; whether large cooperatives could improve systemwide coordination in the economy, including possibly replacing expensive government income- and price-support programs; and whether, with the increased integration of rural markets, cooperatives had lost their main reason for existence.

As cooperatives became larger and more diverse in their operations, often through mergers, the membership of individual cooperatives became increasingly heterogeneous. This raised questions about whether one cooperative could serve a highly diverse group of members, each of whom had differing expectations of the organization. The issue was often phrased in terms of whether one cooperative could serve both large and small farmers. For example,

should a cooperative price its services differentially among its members based on their volume of patronage? The issue applied equally well, however, to a cooperative whose members produced competing products, such as butterfat and vegetable oil, or whose members produced the same product in competing regions of the country (for example, dairy farmers in Wisconsin and Texas, both producing cheese for the national market).

Growth in the average size of cooperatives also implied increased reliance on hired management to handle many of the major decisions facing the cooperative and raised issues of member control. Increasingly, researchers felt uncomfortable with models that assumed that all decisionmaking power resided with the members or that management altruistically sought to maximize members' well-being with no concern for its own welfare. Furthermore, as large, increasingly conglomerate cooperatives began recruiting more managerial personnel from investor-owned firms and business schools, questions arose as to whether cooperatives' practices were really any different from those of IOF's.

During the 1970's, the shift to floating exchange rates, the integration of financial and agricultural commodity markets, and changes in the agricultural trade policies of several major countries, such as the EEC and the USSR, all contributed to much greater instability in agricultural markets. This instability further drew into question previous models of cooperative decisionmaking, which were all variants of the theory of firm decisionmaking under certainty.

While researchers increasingly recognized that existing theories of farmer cooperation did not adequately address these questions, they also recognized that over the previous 20 years there had been impressive advances in several areas related to the theory of the investor-owned firm that possibly could be extended to the theory of the farmer cooperative. These included theories of decisionmaking under uncertainty, behavioral theories of the firm (for example, Simon, Cyert and March), agency theory (Jensen and Meckling), transaction-cost economics (Williamson), the theory of contestable markets (Baumol, Panzar, and Willig), and applications of game theory to firm decisionmaking (Shubik). Research to investigate these areas gained increasing support, particularly from USDA's ACS.¹¹

Approaches Used

Recent work in cooperative theory falls into four categories: (1) extensions of the traditional work on the cooperative as a firm, including analysis of the impact of cooperatives on price and output levels in highly concentrated industries; (2) analyses of cooperatives in what Galbraith has termed "the planning sector," including investigation of the behavior of large, conglomerate cooperatives; (3) models that analyze the cooperative as a special set of implicit and explicit contracts between farmer-members, managers, and other employees; and (4) further work on the cooperative as a coalition. The approaches, particularly the last three, are highly complementary, often addressing the same issue from different perspectives. Indeed, many of the researchers whose work is described in this part of the report analyze cooperatives using more than one approach.

Extensions of the "Cooperative as a Firm" Approach

Several authors have continued to extend the "cooperative as a firm" approach, building models that assume that the cooperative seeks to maximize a single objective. These models trace the consequences of choosing different objectives (net margins, "pay price," etc.) for the cooperative's market behavior, focusing particularly on the implications of this behavior for cooperative finance and antitrust issues. In general, the findings of recent work on the cooperative as a firm reinforce those of earlier theoreticians such as Enke, Helmberger and Hoos, and Kaarlehto. For example, Royer (1982) argues that ideally the goal of a cooperative firm should be to maximize total members' welfare, which is achieved when the sum of members' profits from their farm operations plus cooperative net margins are at a maximum. This is the same goal that Enke posited for consumer cooperatives, and while desirable as a goal for the cooperative, it faces the problem outlined above of not being a stable shortrun outcome unless a quota is imposed on the members' purchases from or sales to the cooperative.

Analyses of Firm-Level Decisions. Cotterill focuses on developing a theory that links cooperatives' product pricing and finance decisions. His approach differs from some of the earlier theoretical work in that he does not focus on what goals the cooperative should *ideally* pursue, but rather on what types of goals it *can* achieve and sustain given how its members and

competitors react to various pricing and financing rules. For example, Cotterill examines how different rules for allocation of joint costs among products in a multiproduct cooperative can affect the competitive position of the cooperative in the various markets in which it operates (pp. 200-201). By allocating a lower percent of joint costs to products in more competitive markets, the cooperative might be able to expand market share in that market at the expense of only small losses in a less competitive market whose products now have to bear a higher proportion of the joint costs. The final outcome depends, of course, on how the cooperative's competitors react to its pricing and cost-allocation decisions. Cotterill's emphasis on identifying sustainable or stable outcomes is similar to some of the game-theoretic approaches to cooperative theory discussed below.

Cotterill stresses that the financial performance of a "competitive yardstick" cooperative cannot be evaluated independently of its performance in the product market because the return to the cooperative's investments accrues to members (and nonmembers) largely through more favorable product prices, not improved cash-flow to the cooperative itself. Therefore, the worth of an investment by a competitive yardstick cooperative must be evaluated in terms of the consumer and producer surpluses it generates to both members and nonmembers through more favorable prices (from both the cooperative and its competitors), not just by increased net earnings of the cooperative. Cotterill's work thus reinforces the basic finding of Enke, namely the need to balance the returns members receive from their cooperative as owners of a profitable enterprise with the benefits derived as patrons of an organization that offers favorable prices and forces its competitors to do so as well.

An implication of this work is that cooperatives that act as competitive yardsticks should not evaluate potential investments simply using measures, such as the internal rate of return, based on how the investment affects the cooperative's cash-flow. The evaluation of cooperative investments is more complex due to the organization's integrated nature. Cotterill defines the "global value" of a cooperative as the amount of money members would pay rather than do without the cooperative (p. 216). The effect of an investment on the cooperative's global value has two components: (1) the return on investment as measured by the cooperative's net margin and (2) the increased cash-flow to members that results from the more favorable prices they pay or receive as a result of the

cooperative's activities. The first component includes benefits members may receive when the cooperative dominates a particular market and is thereby able to earn substantial net margins through strength in purchasing and selling and ability to develop new products and services. The second component, which Cotterill calls the "security value" of the cooperative, includes benefits members derive from more favorable prices offered both by the cooperative and by IOF's that are forced to compete. Evaluating cooperative investments solely on the basis of their impact on the cooperative's net margin ignores the security value of the cooperative and may lead either to underinvestment in the cooperative or to a choice of investments that do not maximize member benefits. This suggests that in evaluating prospective investments, cooperative managers and board members should look not only at how the investment will affect the cooperative's net margins but also how it will affect competition in the industry. Only when the cooperative has no "competitive yardstick" effect on the economy does the cooperative's cash-flow alone provide an unbiased measure of the worth of an investment to the cooperative (Cotterill, pp. 216-17).¹²

Some of the "cooperative as a firm" analyses (Cotterill, Lopez and Spreen) also examine what constitutes "optimum" output and pricing levels for a cooperative and reach a familiar conclusion: If the cooperative faces a U-shaped average cost curve, such as shown in figure 1, and if members take the patronage refund into account when making their sales or purchase decisions, only the "zero-surplus" solution (point C) emerges as a stable equilibrium.¹³ Lopez and Spreen label this point the "myopic equilibrium," arguing that if members could, through some mechanism such as member quotas, limit demand for the cooperative's services to Q_2 , their welfare would increase. They argue that the failure to achieve such an equilibrium voluntarily represents a prisoner's dilemma.¹⁴ If the longrun average cost curve is L-shaped, however, marginal cost equals average cost, and consequently the welfare-maximizing solution corresponds with the zero-surplus solution, leading to a stable welfare-maximizing solution.

Cotterill (p. 195) goes on to analyze the conditions under which it would be in the current members' interest to restrict membership, again reaching conclusions similar to those of Helmberger and Hoos. His work verifies that when average costs of production for the cooperative are rising, it pays current

members to restrict membership, but such restrictions come at the expense of nonmembers, including the public at large.¹⁵ If, in this situation, nonmembers want to join the cooperative, it is because they perceive a benefit from doing so. But because increased volume in the cooperative would raise its average cost of production, per-unit net margins would fall, hurting current members.¹⁶ If, on the other hand, the cooperative is operating in a range where its average costs of production fall with increasing volume (that is, where there are economies of size), both new and old members would benefit from expanding the membership.

Lopez and Spreen, who build a model of a processing cooperative, address a similar issue, namely when it makes sense from the point of view of current members to buy raw product from nonmembers. They conclude that so long as the cooperative can earn an after-tax net margin on nonmember business (after having served all the members) and does not rebate the net margin to nonmembers, members are better off if the cooperative expands its nonmember business. For example, the cooperative might buy from nonmembers in order to expand volume enough to capture economies of size in processing. This can be particularly important when the cooperative is competing with large-volume IOF's. There is a danger, however, in relying too heavily on nonmember trade. If left unchecked, the cooperative members may have an incentive to rely increasingly on nonmember trade, retaining the cooperative surplus earned on that trade as profits for the original members. As original members retire, the remaining members have an incentive to restrict new membership, as an expansion of membership would dilute each remaining member's share of the profits earned on nonmember business. As this attrition continues, the organization is gradually converted from a cooperative into an investor-owned firm. McGregor discusses theoretically how this process can occur and documents how it has occurred in production cooperatives for plywood in the United States and for agricultural products in the South Pacific. There is thus a theoretical justification for placing limits on the amount of nonmember business all cooperatives (not just Capper-Volstead cooperatives) can conduct as well as restrictions on the terms under which it is conducted. Unrestricted nonmember business can threaten the cooperative nature of the enterprise.

Analyses of the Impact of Cooperatives on Market Performance. Cotterill uses his firm-level models to analyze the impact of cooperatives on

industrywide performance in various market structures. He concludes, as did Helmberger, that in monopoly and oligopoly situations, openmembership cooperatives that pay all refunds in cash play an important competitive yardstick role in moving price and output levels closer to those that would obtain under perfect competition. Cotterill argues that if the cooperative, on the other hand, has a closed membership, retains all net margins as unallocated reserves, or issues an allocated patronage refund that is only redeemed after a long period, it will not enhance competition. His analysis shows that such a cooperative, operating in an oligopolistic market in which the other firms are restricting output to jointly maximize profits, will price its goods and services at the same level as the other oligopolists. Hence, the presence of the cooperative in the market will not change the behavior of the other firms at all.

Why won't such a cooperative enhance competition? If the cooperative retains all net margins as unallocated reserves (perhaps investing them in activities outside the particular subsector in which they are earned), then the farmer-members whose business generates those margins will not have any incentive to expand their patronage with the cooperative. (See the discussion of the "hunter cooperative" in the next section.) Similarly, if all patronage refunds are redeemed as cash only after many years, the members are likely to ignore the patronage refunds in making their current patronage decisions, basing those decisions almost entirely on the cooperative's cash price. Cotterill argues that even if the cooperative does rebate net margins to members in cash, if the cooperative follows a closed-membership policy, the rebate will not induce much more production and hence will not threaten the competing firms' market shares.

These conclusions are based on the assumption that the main way in which the market share of the cooperative increases is through attracting new members. If the market share does not change, then the other firms in the market have no incentive to change their pricing behavior. Under some circumstances, however, cooperatives' market share may increase even if the existing cooperative has a closed membership. The most obvious way is if farmers who are currently nonmembers organize another cooperative to try to duplicate the original cooperative's success.

Even if a second cooperative is not formed, the original cooperative may increase its market share. If, for example, members of the cooperative, in response to their share of supernormal profits, expand their production of products handled by the cooperative by

reallocating resources from other activities or by buying out their neighbors who currently patronize the competing IOF's, the market shares of the other firms in the industry will be threatened. Consequently, they are likely to offer more attractive prices to farmers to win back their patronage. The analysis also assumes that unallocated retained earnings are used only in ways that competitors view as nonthreatening. If the unallocated retained earnings simply substitute in the cooperative's financial structure for allocated equities, the cooperative may be able to retire existing allocated equities earlier than would otherwise be possible. Such retirement would increase current returns to members, thereby inducing them to increase their patronage. If one relaxes the assumption that the output of the cooperative is sold in perfectly competitive markets, Cotterill's conclusions also may not hold. If the cooperative has a significant share of the output market and members are free to expand output in response to higher prices, an oligopolistic cooperative may "break the market" for the processed product, causing its IOF competitors to withdraw. This appears to have occurred in the United States processed fruit and vegetable markets during the late 1970's (Staatz, 1984, pp. 294-96).

Despite these caveats, Cotterill's work represents an important theoretical advance in that it provides a framework to analyze the impact of large cooperatives' membership policies and financing practices have on market performance. Viewing cooperatives' pricing and financing decisions together also sheds new light on the alleged tax advantages of cooperatives (Cotterill, pp. 222-23). Because of the patron-owner relationship, the benefits of cooperative ownership are distributed to the members via patronage, in the form of lower prices or as patronage refunds. Such benefits are taxed as ordinary income. In contrast, many of the benefits of IOF ownership take the form of capital gains in the value the stock, which, prior to the 1986 tax reform in the U.S., were taxed at a substantially lower rate than ordinary income. Cotterill shows that under quite plausible tax rate assumptions, cooperatives were actually disadvantaged relative to IOF's prior to the 1986 reform.

Cotterill also addresses why cooperatives may want to use unallocated retained earnings when they face a risky market environment (pp. 250-51). When the market is risky, the cooperative's returns will fluctuate from year to year. Management can draw on unallocated reserves to smooth out patronage refunds over time. This gives a steadier return to members,

makes investment in the cooperative appear less risky to them, and hence increases their willingness to invest in the organization. The increased willingness to invest in the cooperative for a given interest rate reduces the cost of capital to the cooperative, thereby allowing it to expand more rapidly.¹⁷

Competition Among Cooperatives. Another issue theorists have investigated recently is competition among cooperatives (Cotterill; Rhodes, 1983, 1987a). Such competition is common, even when the cooperatives involved are owned by the same farmers, resulting in the farmer-owners' competing against themselves. Cotterill and Rhodes show that in industries where diseconomies of scale are not significant and where the minimum efficient scale of operation is large relative to the size of the market, farmers would often be better served if their cooperatives colluded or merged rather than engaged in head-to-head competition. Such collusion or consolidation would allow more efficient use of facilities and the capturing of scale economies, which could be passed on to the farmer-members. As Rhodes (1987a) points out, however, there are often pressures from within the competing cooperatives that encourage such competition. These include a desire to "keep management on its toes," the vested interests of management and board members who might lose their positions if a merger occurred, the vested interests of farmers whose handling costs to the cooperative might increase dramatically if operations were consolidated (particularly important for bulky items like milk), and support for competition by those farmers who reside in the overlapping areas of the competing cooperatives. These farmers, for whose patronage the rivals are competing, often benefit from cutrate prices, etc., that result from the competition, while members in nonoverlapping areas bear the costs. Rhodes suggests that such situations may be amenable to analysis using bargaining models such as those discussed below.

Analyses of Cooperatives in the Planning Sector

John Kenneth Galbraith, in his book *The New Industrial State*, divides the economy into a "planning sector," composed of large firms that possess market power, and a "market sector," composed of smaller firms that operate as price takers in competitive markets. Galbraith argues that planning-sector firms are forced by the "technological imperatives" of modern large-scale production to make huge fixed investments in plant and equipment. These make the

firms extremely vulnerable to economic fluctuations. To protect themselves, the planning-sector firms try to control their environment by administering prices, influencing the political system to ensure favorable regulatory treatment and macroeconomic stability, and so on. Three authors (Rhodes, Sexton, and Shaffer) have attempted to extend earlier theoretical work on the effects of cooperatives on concentrated markets to include discussion of the role of large cooperatives in the planning sector.

Theory of Contestable Markets. Previous analyses, such as that of Helmberger, compared the price and output levels that cooperatives would generate in concentrated markets with those that would prevail under perfect competition. Rhodes (1983, 1987b) and Sexton (1984a) extend this type of analysis by using concepts from the recently developed theory of contestable markets (Baumol, Panzar, and Willig). This theory stresses that it is not the degree of market concentration per se that determines market performance, but the nature of the costs in the industry and the barriers to entry and exit. Hence, an industry with a high degree of market concentration may perform well if it is "contestable," that is, if barriers to entry are low enough that the *threat* of entry from competing firms disciplines the behavior of firms presently in the industry.

Rhodes and Sexton show that cooperative entry or the threat of entry into a broad range of concentrated market structures can play a powerful role in forcing IOF's to behave more competitively. They point out that the threat of entry by a cooperative may be more effective in improving the market performance of incumbent firms than the threat of entry by an IOF. A potential IOF entrant decides whether to enter the market based on an evaluation of the likely *post*-entry market conditions, for example, whether the incumbent firms will retaliate by offering farmers more favorable prices. A farmer cooperative, on the other hand, bases its decision on *pre*-entry conditions. If the incumbent firms do not retaliate, the cooperative captures a substantial net margin, which it rebates to members. If the incumbents do react by offering farmers more favorable prices, the cooperative's members benefit directly. Either way, the farmer-members gain. The incumbent firms can deter cooperative entry by offering farmers more favorable prices and cutting profit margins, but this simply means that these firms are forced to act in a more competitive manner, which obviates the need for a cooperative (Sexton, 1984a, pp. 283-356). Hence, the mere *threat* of cooperative entry

may serve an important competitive yardstick function. Rhodes (1987b, p. 110) states that historically this effect has "been greatest in those markets of moderate barriers—where the rewards have been worth seeking and have not been so protected that cooperatives could not achieve them."

Rhodes (1983) argues that because cooperatives rebate net margins to members, in certain oligopolistic industries, large regional cooperatives may eventually tend to dominate the market. Concentrated industries often are characterized by high profit margins. If IOF competitors do not cut their prices in response to the entry of a cooperative, the cooperative earns a substantial net margin, which it rebates to members. The rebates attract new members, increasing the cooperative's market share. Faced with the option of cutting their prices substantially to compete with the cooperative, the IOF's may simply prefer to withdraw gradually from the industry and redeploy their capital in other, higher return sectors of the economy. Rhodes suggests that this phenomenon explains the expansion of several large midwestern supply cooperatives during the 1970's, when the petroleum and agrochemical industries in the United States were operating under the price umbrella of the oil oligopoly.

The Hunter Cooperative. While cooperatives may often reinforce competition, Rhodes (1987c) argues that in some large cooperatives the relationship between the members and management is very similar to that which exists between an IOF and its customers. In such cooperatives, the preceding arguments may not hold. He describes what he calls the "hunter cooperative," an organization that aggressively seeks new activities based solely on the criterion of relative profitability, with little attention to members' current activities. It is an organization that, in Enke's terms, focuses purely on the maximization of producer surplus rather than on striking a balance between the benefits derived from producer surplus and those derived from consumer surplus. In other words, the hunter cooperative seeks profit simply at the level of the cooperative rather than attempting to improve vertical coordination between the farm and the rest of the marketing chain. While there are probably no cooperatives that operate continuously as pure hunter cooperatives, many cooperatives may exhibit hunter behavior from time to time.

Rhodes argues that such organizations are often disloyal to their members in the sense that the capital contributed by current members is used to finance entry into new activities from which the current members do not benefit. For example, retained earnings from cherry

marketing might be used to finance entry into beef processing. “Even the classic defense of the cooperative monopoly—that it doesn’t really monopolize because the flow-through to members encourages producer supply response rather than supply restriction—would not apply to a cooperative management that diverts its earnings into developing new enterprises and markets” (p. 163).

Cooperatives do, however, need flexibility to modify their mix of activities as economic conditions change, and Rhodes argues that the challenge for cooperatives is to find a middle ground: “A member whose cooperative can abandon him at any time does not have much incentive to be a member. But a cooperative that can never turn away from old members is likely a firm condemned to eventual insolvency” (ibid.).

Shaffer’s analyses of the role of the cooperative in the planning sector focuses on the role that large cooperatives (or federations of smaller cooperatives) could play in improving economic coordination in the context of pervasive uncertainty. His work emphasizes the explicit and implicit contracts between the cooperative and its members and is discussed in the following section.

The Cooperative as a Nexus of Contracts

The debate over whether to model the cooperative primarily as an independent firm or as a form of vertical integration by its member firms is far from resolved. As outlined above, some authors continue to view the cooperative as a separate firm pursuing a single objective. On the other hand, Sexton (1984a, p. 15) argues that cooperation represents “horizontal coordination to achieve mutual vertical integration,” and Shaffer (p. 61) contends that cooperatives represent neither market relationships nor vertical integration, but “a third general mode of organizing coordination, combining characteristics of markets and internal (integrated) coordination in ways which are different from either.” There are, of course, elements of truth in each of these views. The cooperative is a legal entity separate from its member firms, having its own bureaucracy and its own decisionmaking apparatus. This apparatus, however, is at least nominally controlled by the members, via the board of directors, and members join the cooperative to gain the advantages of vertical integration. In the final analysis, what is crucial is not how we label the cooperative but the nature of the business relationships among the

various participants in the organization (farmer-members, managers, other employees, board members, etc.). These relationships can be viewed as representing a set of explicit and implicit contracts. For example, when a farmer joins a cooperative, that person implicitly contracts with the other members of the organization for a share of the net earnings of the organization (distributed in proportion to patronage) in exchange for an initial membership fee, other capital contributions to the cooperative (that is, per-unit retains), and meeting the other conditions of membership. This implicit contract is different from that which exists between a stockholder and an IOF, and hence one would expect the two types of organizations to behave differently. It is the nature of the implicit and explicit contracts among participants in a cooperative that determines the degree of member or managerial control, the degree to which the cooperative achieves goals similar to those of a vertically integrated firm, and so on.

Since 1980, several authors have examined the nature of these contracts, in part out of concern for whether members really “control” large cooperatives and whether the behavior of these cooperatives is really any different from that of large IOF’s. These authors have used two related theoretical tools, originally developed for the analysis of ownership and control issues in IOF’s: applications of agency theory and analyses based on concepts from transaction-cost economics. Both approaches have then been used to analyze potential opportunities for and barriers to using cooperatives to improve economic coordination.

Agency Theory Approaches. Agency theory views an economic organization as a collection (or nexus) of contracts among various participants who provide the organization inputs, including labor, managerial talent, and capital, and purchase its outputs. For example, stockholders of an IOF hire (contract with) management to carry out the day-to-day running of the firm in a way that will maximize the stockholders’ return on investment. In exchange, management receives certain benefits, such as salary and stock options. Agency theory posits that each participant (or “agent”) in an organization seeks to maximize his or her own welfare. There is no automatic presumption, for example, that managers of IOF’s selflessly promote the interests of stockholders. To ensure that management acts in the interest of the stockholders, the stockholders must incur the costs of monitoring the performance of management. The higher the costs of keeping tabs on management, the

more latitude management has to pursue its own goals. Agency theory analyzes the types of mechanisms available to agents for monitoring others' compliance with the implicit and explicit contracts within an organization, the costs that each monitoring mechanism involves, and the implications of these for the organization's performance.

Two contracts that agency theorists particularly stress are those that specify the nature of the "residual claims" in the organization and the allocation of the decision process among agents (Vitaliano, 1983). When agents contract to perform services in an organization, they promise to do so in exchange for either a fixed claim or a residual claim on the cash-flow of the organization. A fixed claim is a fixed amount of money, such as a salary or an input price, received for a good or service provided to the organization. A residual claim is a claim on the amount of money left over from the cash-flow after all the fixed claims (wages, input payments, etc.) have been met. Hence, residual claimants are those agents who contract for a share of the difference between the organization's gross revenue and the payments promised under fixed-claim contracts. In an IOF, the residual claimants are the owners of common stock, who share the after-tax profits of the firm in proportion to their capital investment. In a cooperative, the residual claimants are the patron-members, who share the net margins of the cooperative in proportion to patronage.

Agency theorists separate decisionmaking authority in the organization into *decision control* and *decision management*. Decision control involves setting policies for the organization and monitoring their implementation, and is handled by representatives of the residual claimants, such as the board of directors. Decision management involves actually implementing those policies, and is handled by managers. Using this framework, Condon summarizes the key difference between a cooperative and an IOF as follows:

"In an IOF, control over how resources are used and the rights to residuals ultimately rest in the hands of the owners of common stock in the organization. Decision control is based on the share of capital invested, and decisions are presumed to be judged on the merits of the returns generated by that capital. In a cooperative, the basic property rights governing ownership and control are structured so that decision control and the rights to residuals rest solely in the hands of those who patronize the firm as members....Ancillary to this restructuring of rights is the fact that cooperative firm control is generally based on

1-man, 1-vote terms and not by share of capital invested. In addition, because membership and control in such organizations is restricted, these rights have value only so long as the member firm or individual remains an active patron."

Condon and Vitaliano argue that a very important result of this structure of residual claims in a cooperative is that it results in a very limited or nonexistent secondary market for cooperative equity certificates, such as common stock. Because there is no secondary market, cooperative equity certificates typically do not have a market-determined value that fluctuates in response to changes in the earnings potential of the organization. The equity certificates' only cash value is their par value at the time they are redeemed, which does not necessarily reflect the value of the cooperative to the member.¹⁸

The lack of a secondary market for cooperative stock may have several significant consequences (Condon and Vitaliano; Staatz, 1984, pp. 94-114; Staatz, 1987a, pp. 44-50; Shaffer, pp. 63-65). First, it restricts member-owners from diversifying their portfolios to spread risk. Owners of farmer cooperatives typically have invested most of their assets in their farms and cooperatives, that is, in one or two particular lines of agriculture. In contrast, IOF stockholders often have highly diversified portfolios (particularly since the rapid growth of mutual funds), which reduces investment risk. Because the owners of a cooperative have "all their eggs in one basket," they may pressure cooperative managers to be more risk averse in their strategies than their IOF counterparts.

Second, the lack of a secondary market for cooperative stock denies the cooperative's stockholders the possibility of using the market price of the stock as an indicator of management performance or as a way of rewarding better managers. Managers of IOF's recognize that poor performance on their part will affect the stock price, which may lead to either proxy fights aimed at replacing management or attempts at hostile takeovers.¹⁹ Indeed, a whole industry, typified by *The Wall Street Journal* and various investment counseling services, has emerged to convey information to current and potential stockholders of IOF's about the performance of managers, based in part on how their actions have affected stock prices. IOF's have also tried to strengthen managers' incentives to perform well by offering them stock options. If the firm does well financially, boosting the stock price, the manager benefits directly. Because cooperatives lack a fluctuating stock price, members cannot use the stock

price as an indicator of management performance, the board cannot offer managers stock options as an incentive to perform better, and there is no threat of hostile takeovers to discipline management. Consequently, cooperative boards of directors are forced to play a much more activist role than their IOF counterparts in directly monitoring the performance of the management. Failure to do so can leave management with considerable scope to pursue its own objectives.

A third consequence of the lack of a secondary market for cooperative stock is that members of the cooperative may have an incentive to underinvest in the cooperative, particularly with respect to long-term investments. Members may even push for decapitalization of the firm. Decapitalization can take several forms short of outright liquidation. For example, patron-owners may encourage management to enter into price wars with competitors, which generate short-term benefits in the form of more favorable prices for the patrons, but at the cost of the long-term viability of the cooperative. This tendency in cooperatives to favor short-term gains at the expense of long-term losses has been dubbed "the horizon problem." It arises because equity certificates of a cooperative confer a residual claim on the earnings of the organization *only so long as the member remains a patron*. Therefore, a stockholder of a cooperative has an incentive to underfund investments that would be profitable for the cooperative as a whole but whose benefits accrue largely after the member has retired. The tendency is likely to be most acute among members nearing retirement, as they are eager to recuperate their equity from the cooperative before retiring. The theory also suggests the problem will be more severe in cooperatives lacking mechanisms, such as viable equity retirement programs that permit members to recover their accumulated investment in the organization by means other than decapitalizing the co-op. The problem is also likely to be more acute in local cooperatives, where the members are individual farmers who have a limited lifetime, than in regionals, where the members are local cooperatives that are likely to remain members of the regional for an indefinitely long period (Haydu, pp. 76-78).²⁰

Several factors may attenuate the horizon problem. If farmers can transfer their membership intergenerationally or if the cooperative membership is saleable with the farm, then the current member has an incentive to take long-term viability of the cooperative and future income into account.²¹ Similarly, if

the cooperative follows a completely open membership policy, then the value of the cooperative will be capitalized into the farms of the cooperative's service area, and the farmers will have an incentive to maintain the organization. The problem will also be reduced if members gain nonmonetary benefits from bequeathing a viable cooperative to their heirs or if the cooperative runs a pension program for retired members, whose value depends on the future financial performance of the cooperative.

Although it may be in the interest of some of the older members to try to decapitalize the firm, it is not in the interest of the management. Ironically, management, in pursuing its own interest, may end up defending the cooperative from some of its members (Murray, 1983a, p. 57).

The impossibility of benefiting from capital gains of cooperative stock may also reduce the incentive to found a cooperative even when the net social benefits of doing so exceed the net social cost (Shaffer, p. 66). Whereas an entrepreneur who founds a successful IOF is rewarded with substantial capital gains as the net worth of the firm increases, no such reward exists for the founder of a cooperative. Rather, the motivation to found a cooperative sometimes may be more a sense of social injustice than immediate personal gain. Because individual material incentives to start a cooperative may be lacking even when ample social justification for the cooperative exists, there may be a legitimate role for governmental support to encourage the formation of cooperatives.

Transaction-Cost Approaches. The transaction-cost approach to cooperative theory builds on earlier theoretical work on the IOF by Ronald Coase and more recently by Oliver Williamson. A transaction occurs whenever a good or service is transferred between two stages of a production system or subsector that potentially could be run by separate firms. (Williamson refers to such stages as "technologically separable activities.") For example, when processing apples are transferred from grower to processor a transaction has occurred, as growing and processing can be carried out by two separate firms. There is no *technical* reason why the growing of the apples and their processing need to be carried out by the same firm. There may, however, be good *economic* reasons why the two activities should be integrated within one firm, and transaction-cost economics attempts to explain what those reasons are. More generally, the transaction-cost approach focuses on how the characteristics of a transaction affect the costs of handling it through

markets, through bureaucracies (for example, a vertically integrated firm), or through other forms of organization, such as cooperatives. The basic idea is that each type of good or service has a set of characteristics that affect whether it is cheaper to produce and distribute the good or service through markets, integrated firms, cooperatives, or some other means.

The costs of carrying out a transaction include gathering and processing the necessary information, reaching decisions within the organization, negotiating contracts with other parties, and policing and enforcing the contracts. Transaction costs arise largely because the pervasive uncertainty in the world prevents contracts from specifying all possible future contingencies and because when unforeseen circumstances arise, people may act opportunistically, taking advantage of their trading partners. For example, if a firm buys a highly specialized piece of equipment and later experiences an unanticipated problem with it that is not covered by an explicit warranty, the seller of the equipment may charge an exorbitant amount to repair it. Because it is impossible, when drafting a contract, to foresee all possible future events and design the contract to deal with each of them explicitly, it is necessary to design the contract in a general way that protects each party if unforeseen occurrences arise. For example, a contract may specify an arbitration procedure to settle any dispute not explicitly covered elsewhere in the contract. Each form of business organization, such as an IOF or a cooperative, embodies different types of such explicit and implicit contracts. The transaction-cost approach argues that the organizational form or "governance structure" that minimizes the sum of production and transaction costs for a given activity will have a competitive advantage and tend to dominate that activity. Transaction-cost economists would argue, for example, that it is no accident that the collection and processing of milk in many countries is organized on a cooperative basis but that automobile dealerships are not. Certain characteristics of milk production (for example, perishability of the product and the high level of specialized investment by the farmer) give cooperatives a particular advantage in this domain, while such characteristics do not exist in auto retailing.

Each governance structure embodies a different set of explicit and implicit contracts among the participants in the transaction. Shaffer and Staats (1984, 1987b) analyze how these contracts among participants in a cooperative, particularly between the

cooperative "firm" and the member-patrons, affect the performance of the organization compared with that of an IOF. The contract linking the farmer-members with the cooperative differs from the links within a vertically integrated firm because the cooperative usually cannot dictate the production decisions of its farmer members. The contract also differs from coordination that relies on the spot market, in that the contract between the cooperative and the member is always a contingent contract, with the final price adjusted, via the patronage refund, depending on the cooperative's performance. Although IOF's sometimes also practice contingent pricing, cooperatives may have an advantage in this form of risk sharing because farmers may be more willing to trust that their own organization will not use this practice dishonestly. In many ways, the cooperative-patron relationship resembles two types of contracting that sometimes occur among IOF's, called "neoclassical contracting" and "relational contracting" (Williamson, pp. 70-72). In neoclassical contracting, the contracting parties make no attempt to specify all possible future contingencies, but simply specify a process, such as binding arbitration, to resolve unforeseen disputes. Relational contracting involves a more general understanding among the contracting parties that disputes will be settled amicably to preserve a valued long-term relationship.

The level of trust among the contracting parties is particularly important when the contract leads to investment in highly site- or use-specific assets, such as a fruit orchard. Once made, the value of these assets in use greatly exceeds their salvage value (that is, the investment in the assets becomes a sunk cost), which makes the asset owner potentially liable to exploitation by its trading partner (for example, a processor). By acting opportunistically, for example, by promising a remunerative price for the output produced by the asset and then reneging on the agreement once the investment in the highly specific asset has been made, a trading partner who has other market alternatives can capture the returns that would have otherwise accrued to the highly specific asset (Staatz, 1984, pp. 164-70). In such situations, there are incentives to integrate vertically (for example, for the orchard owner to buy the processing plant to escape this type of exploitation), and in many situations cooperatives represent a superior form of vertical integration to IOF's (Shaffer, pp. 77-78; Staats, 1984, pp. 164-67; Staats, 1987b, pp. 88-90). Failure to deal with the trust issue may lead to missed economic opportunities, as potentially profitable investments are foregone because of the potential risk

arising from opportunistic behavior (Shaffer, pp. 77-78).

Cooperatives and Economic Coordination. As economies move away from subsistence agriculture to more complex forms of organization, the task of coordinating the activities at various levels of the economy becomes more crucial. Because cooperatives involve elements of vertical integration and because of the way the explicit and implicit contracts linking participants in cooperatives are structured, cooperatives potentially offer advantages in coordinating certain types of activities (Shaffer; Shaffer and Staatz). One area of theoretical work has focused on these potential advantages and the barriers to achieving them.

Economic coordination can be formally defined as the process whereby productive activities in various parts of the economy are harmonized so that goods and services are produced without major bottlenecks. Shaffer (p. 61) describes the coordination problem as follows:

“In the modern economy, the activities of thousands of people and resources scattered over thousands of miles contribute to producing and distributing a single product such as a loaf of bread. The contributions are made over a period of many years, past contributions being embedded in capital goods, knowledge, institutional structure (including firm organization), and inventories. How to coordinate these contributions when at each step of the production-distribution sequence information and mechanisms of control are imperfect is a central economic problem. Production decisions must be made under conditions of uncertainty as to future supplies of inputs and demand for products. The future is inherently uncertain. If information about future input supplies, product demands, and transformation functions were perfect, resources were perfectly mobile and divisible, contracts were perfectly drawn and enforceable, and no firm had power to influence its prices, coordination would be simple. But none of these conditions exist in the real world.”

Coordination problems exist at four levels:

1. Coordination within the firm, which Shaffer calls *micro-micro coordination*;
2. Coordination between individual firms (for example, between farmers and processors), or *micro coordination*;
3. Coordination of total supply with total demand for individual commodities or industries at each step of the production-distribution process (*macro*

coordination); and

4. Coordination of aggregate demand with aggregate supply for the economy as a whole (*macro-macro coordination*).

Although coordination at these different levels of aggregation is interrelated, most of the theoretical work has focused on the potential roles of cooperatives in improving vertical coordination among firms in a given subsector (micro coordination) and in helping to achieve a better supply-demand balance within entire industries (macro coordination). The emphasis has been on those characteristics of cooperatives that could improve the functioning of the entire cooperative system rather than just the performance of individual cooperatives.

The analysis of micro coordination stresses the potential for greater use of forward contracts—for example, between farmers, input distributors, and input manufacturers. Such contracts could allow farmers and their cooperatives to capture many of the advantages of vertically integrated firms, such as reduced inventory and delivery costs, while maintaining advantages of decentralized decisionmaking. The analysis of macro coordination harkens back to the work of Sapiro, focusing on ways that cooperatives can help “match productive capacity with ultimate consumer demand at prices consistent with costs” (Shaffer and Staatz, p. 53). This research focuses on issues such as competition among cooperatives and the potential to use cooperatives to replace elements of current government support programs. Shaffer suggests that a system of forward deliverable contracts, administered by openmembership cooperatives, could provide participants in the economy with more reliable information on future supply, demand, and prices prior to important production decisions, thereby improving macro coordination. Such a system might also provide a more stable environment for farmers, thereby contributing to a more orderly and less painful adjustment out of agriculture.

The work on cooperatives and coordination generates numerous hypotheses regarding how cooperatives could take additional actions to improve economic coordination and increase member benefits. An obvious question is why they do not. Three possible answers come immediately to mind: (1) members and managers are unaware of the potential benefits; (2) while there would be positive net benefits to undertaking these actions, the distribution of costs and benefits among participants is such that key actors

do not have an incentive to participate (in particular, there may be free-rider problems); (3) the theory is wrong. Obviously, one avenue for future research is to sort out these alternatives.²²

The Cooperative as a Coalition

Recent theoretical work has also built on earlier work that viewed the cooperative as a coalition. The basic notion of this approach is that the cooperative is composed of several kinds of participants (farmers of different types, managers, other employees, board members, input suppliers, and lenders), each of whom seeks to maximize his or her own well-being. They may not all have the same objectives for the cooperative, so the participants bargain among themselves to agree on courses of action that enable each participant to achieve at least some of his or her objectives. For example, to qualify for a loan, a cooperative's board and management may have to bargain with the lender over what the appropriate performance criteria should be for the cooperative. The coalitional analyses focus on the types of stable outcomes (equilibria) that are likely to emerge from such bargaining processes and whether common cooperative practices, such as one-member, one-vote and patronage-based financing, generate stable equilibria, that is, situations in which no participant has an incentive to change his or her behavior.

Voting Within Cooperatives. Initial attempts by economists to analyze how the various participants within a cooperative came to agree on rules, for example, for cost allocation and financing, tried to model the bargaining as a voting process (Zusman, Knoeber and Baumer). These analyses concluded that several of the common financing and cost-allocation practices of cooperatives are likely to lead to stable equilibria. The models assumed, however, that the members decided each issue entirely on its own merits (no vote swapping occurred), that the membership was not split into two widely divergent camps on the issue, and that all issues were decided by a simple majority-rule vote.²³ If these assumptions are met, modeling the cooperative's decision process reduces to modeling the preferences of the median or "typical" member. It soon became apparent, however, that in most agricultural cooperatives, policy decisions involve several interrelated issues, about which members may have quite diverse preferences. In such situations, simple majority-rule voting models need to be replaced with bargaining models (Zusman).

Bargaining Within Cooperatives: Game-Theoretic Approaches. Murray (1983a, 1983b) analyzes decisionmaking in British agricultural cooperatives, particularly concerning financing, as a bargaining process between farmer-members and managers. He argues that because of the imperative facing farmer-members to invest heavily in their own farm operations, members have an incentive to underfinance their cooperatives. Managers, on the other hand, favor capital accumulation, as this increases managerial flexibility and growth of the cooperative, which is strongly correlated with managerial rewards. Managers, therefore, push for unallocated reserves. Ironically, if management is successful in pursuing its own goal of growth rather than the goals of the membership, the manager may act as guardian of the cooperative's long-term viability by ensuring its adequate capitalization, albeit at the cost of some loss of member control. Murray argues that the financing arrangements that finally emerge depend on the relative bargaining strengths of the parties involved, but he does not formalize the bargaining process in an explicit mathematical model.

In recent years, a few researchers have attempted to model group choice in cooperatives using game theory (Sexton 1984, 1986; Staats 1984, 1987b). Game theory is a technique developed to analyze group choice when the preferences of the members of the group regarding an issue are at least partially conflicting and when the welfare of each member (or "player," to use the game-theory term) depends on the actions of the other members.²⁴ These are conditions that often hold in cooperatives. For example, members may disagree about whether to offer volume discounts to large patrons, and the welfare of small-volume members depends on how large-volume members behave—for example, whether they abandon the cooperative if no discounts are offered.

Sexton and Staats argue that many decisions in cooperatives, such as the pricing of goods and services, the allocation of joint costs and pool receipts among producers of different products, and whether to merge competing cooperatives, can be modeled using the theory of cooperative games. Cooperative games are those in which players communicate and make binding commitments, such as contracts. The theory of cooperative games is commonly used to model situations in which there are gains from joint action by a potential coalition of players, but where the players must bargain among themselves about how the net benefits of the joint action are to be shared. Failure to

agree on an allocation of net benefits among players prevents the coalition from forming. In other words, in order for the players to cooperate with one another, it is not enough for them to know that by working together they can bake a bigger pie. They must agree on a way of slicing the pie so that each piece is at least as big as that which the player could get by working independently or with some other coalition. The essence of the argument is that individuals will not join in the cooperative's activities unless they are better off under that arrangement than under any other alternative open to them. Game theorists label the set of allocations of benefits among players that makes everyone better off by remaining in the coalition (cooperative), the *core* of the game.

Sexton and Staatz apply game-theoretic models to a number of different situations facing cooperatives, including the pricing of goods and services to members. They show that in many situations, charging the same price to all members does not generate a stable equilibrium; some members (those with better market alternatives) have an incentive to defect from the cooperative. The analysis also shows that average-cost pricing, such as advocated by Helmberger and Hoos (fig. 1), does not generate a stable coalition when average costs are rising, as some subgroup of members always has an incentive to break away and produce the good for itself at a lower average cost. The optimal way of financing a cooperative, in terms of always generating a core solution, involves two-part pricing, that is, charging all members the marginal cost of producing the good or service and levying fixed charges (for example, required stock purchases) to cover the fixed costs. To generate a core solution, the fixed charges need to vary by member in proportion to how much the member's profits are enhanced by membership in the cooperative (Sexton, 1986).

Hence, the game-theoretic analysis shows that in certain circumstances, differential pricing of goods and services is necessary to prevent certain members from leaving the cooperative. To prevent defection, the differential pricing must reflect both how a member's patronage affects the cooperative's costs of operation (this is just an extension of the service-at-cost principle) and the member's strategic opportunities for obtaining the good or service outside the cooperative. Furthermore, the analysis shows that in situations where a cooperative's average cost of providing a good or service to the membership first decreases then increases, there may be no way of pricing the service, other than Sexton's proposed two-part pricing, that

gives everyone an incentive to stay in the organization. This situation suggests that cooperatives need to be very careful in deciding when to expand their membership and/or mix of activities, expanding only when there are clear synergies that allow the organization to hold down its average costs. The impossibility of finding a stable way of pricing the services among a heterogeneous membership may prevent cooperatives from "doing all things for all people."

While the game-theoretic analysis shows that many of the current pricing practices of cooperatives are theoretically unstable, it implicitly assumes that all members of the cooperative possess perfect information about their market alternatives and can establish new contracts with alternative buyers and suppliers at no cost. Obviously, neither condition holds in reality. Incorporating into the analysis these, other transaction costs, and the nonmonetary benefits that some members may derive from belonging to a cooperative broadens the set of potentially stable solutions (Staatz, 1984, pp. 279-314; Staatz, 1987b, pp. 132-39).

Nonetheless, the basic concept underlying the "cooperative game" analysis remains valid: to prevent a proposed allocation of costs and benefits in a farmer cooperative from inducing defection, careful attention has to be given to the payoffs facing individual members. The increasing tendency of large local supply cooperatives ("super-locals" or "mini-regionals") in the Midwest to bypass their regionals and contract directly with input manufacturers is an example of the type of breakdown in a cooperative coalition that may occur when the allocation of costs and benefits among members lies outside the core.

Cooperative Loyalty: Theory of Noncooperative Games. Certain types of situations in agricultural cooperatives, such as how to ensure member loyalty in a "competitive yardstick" cooperative, are more appropriately modeled using another branch of game theory, the theory of noncooperative games (Staatz, 1984, pp. 263-75; Staatz, 1987b, pp. 127-31). In noncooperative games, high communication costs, unenforceability of contracts, or lack of trust lead players to eschew joint strategies and act independently. A particularly well-known form of noncooperative game is called "the prisoner's dilemma," which describes a situation in which all the players face individual incentives to act independently, even though the group as a whole, as well as each individual member, would be better off if they cooperated.²⁵

The prisoner's dilemma has been used by economists to describe free-rider situations, that is, situations in which group action can make everyone better off but in which individuals can share in the benefits of the group action without paying a portion of the costs. If enough people act as "free riders" in this way, the group action doesn't occur. An example of "free riding" in cooperatives is a group of dairy farmers breaking away from a dominant dairy cooperative that provides market-balancing services. These farmers form a limited-service cooperative, serve their members at a lower cost, and still benefit from the larger co-op's market-balancing actions. If enough farmers form such breakaway cooperatives, the large cooperative will collapse or have to abandon its market-balancing services, making all dairy farmers worse off. A more general example of free riding is the failure of farmers to patronize their cooperative adequately even though they recognize that the "competitive yardstick" activities of the cooperative are responsible for the favorable prices offered by the IOF's.

If such situations truly represent prisoner's dilemmas, then game theory predicts that cooperatives' provision of services like these will ultimately break down due to pervasive free riding. However, two characteristics of the classical prisoner's dilemma that ensure this dismal outcome need to be examined. First, the players are unable to make binding commitments with each other. Second, the game is played only once, and the players have no concerns about cooperating in subsequent periods, developing reputations as reliable partners, and so on. If they do, a simple prisoner's dilemma may not be an appropriate model.²⁶ For example, farmers don't simply face a one-time decision of whether to join and support a cooperative; that choice is continually before them. Reputations clearly do matter. Cooperatives may expel habitually "noncooperative" members even if doing so imposes some short-term cost on the remaining members.

If players face recurrent prisoner's dilemmas, patterns of cooperation among the players may evolve. If a single-period game (called a *constituent game*) is infinitely repeated, a new game is defined (called a *supergame*) in which the payoffs are the net present values of the stream of benefits from the constituent game. Game theorists have shown that even if the constituent game is a prisoner's dilemma, the resulting supergame need not be. Staatz (1984, pp. 265-69; 1987b, pp. 129-31) uses the theory of supergames to derive suggestions for attenuating freeriding in cooperatives. His analysis suggests:

(1) Cooperative loyalty will be greater among those who will be farming for an indefinite period compared to those who are close to leaving farming, *provided* there is no way for the individual leaving farming to continue to benefit from the existence of the cooperative, such as through capitalization of the value of the cooperative into the value of the member's land, through a "pension" provided by the retirement of the member's accrued equity in the cooperative, or through non-monetary (psychic) benefits from supporting the cooperative.²⁷ If those leaving farming will have no further payoffs from the cooperative once they leave, theoretically they have no incentive to remain loyal to it as they near retirement.

(2) Cooperative loyalty increases as the penalties (both monetary and psychic) for disloyalty increase. Although this is hardly a surprising finding, it is sometimes ignored by cooperative practitioners. Although managers sometimes express astonishment that members who have substantial investments in a cooperative are not more loyal to the organization, in many instances the benefits a member receives from investment in a cooperative is only weakly conditional on continued patronage (Staatz, 1987a, pp. 40-41).

(3) A farmer's cooperative loyalty decreases as he or she increasingly discounts future returns compared with current returns. For example, highly leveraged farmers are likely at times to face severe cash-flow constraints and therefore have a high discount rate. The widespread notion that young farmers as a group display less cooperative loyalty than older farmers may in part be attributable to younger farmers being more highly leveraged than their older counterparts. In a cash-flow bind, many young farmers may not be able to afford cooperative loyalty if more favorable prices or credit terms are available elsewhere.

Conclusions. The game-theoretic analysis stresses that farmer cooperatives cannot always single-mindedly pursue the simple objectives posited in earlier models of cooperative behavior, such as maximization of per-unit surplus. Doing so may result in a distribution of member benefits that creates incentives for certain members to leave the organization. Similarly, given a heterogeneous membership, rules such as "equal treatment for all" may in certain circumstances lead to no service for anyone, as they precipitate the disintegration of the organization. Furthermore, because of the free-rider problems inherent in many of the activities undertaken by cooperatives, in some circumstances what is good for the individual cooperative participant may not be good

for the cooperative as a whole. Therefore, if cooperatives are to succeed in fulfilling important social roles such as acting as competitive yardsticks, they may need to develop rules that increase the cost of exiting from cooperatives. Developing such rules involves striking a delicate balance, as retaining some threat of member exit may be necessary to ensure good performance by the board and management.

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

Cooperative theory has nearly come full circle. The early models of the cooperative as a form of vertical integration viewed decisionmaking in cooperatives as being entirely decentralized, residing solely with the farmer-members. The “cooperative as a firm” models, on the other hand, saw the cooperative as maximizing a single objective, presumably set for it by the manager. Much of the recent theoretical work reviewed above has reintroduced a degree of pluralism into models of cooperative decisionmaking, but has done so in a broadened and institutionally richer framework than that of the early models. Not only has the list of potential participants been broadened to include managers, other personnel, competitors, nonmember customers, input suppliers, and the state, but the complexity of the decisionmaking process itself has been more fully portrayed.

Implications of Recent Theoretical Research

The recent theoretical work has shown that the structure of cooperatives offers them opportunities and creates challenges for them different from those present in IOF's. Consequently, cooperatives may perform differently than IOF's, both as individual economic entities and in their effect on the wider economy. Theory suggests that whether an individual cooperative realizes its potential for improving economic performance and farmer welfare depends critically on the cooperative's structure and practices. To answer the question posed at the beginning of this report, cooperatives can be still relevant, but whether they are is largely up to them.

Cooperative Goals and Governance

The recent theoretical research suggests that setting operational goals for individual cooperatives involves striking delicate balances. For example,

unfettered pursuit of “the bottom line” in the sense of maximizing the cooperative's net margin is suboptimal as is the sole pursuit of more favorable prices to farmers. Hence, the evaluation of investments is more complex for a cooperative than for an IOF, as one has to take into account the investments' effects both on the cooperative's net margins and on market prices. The cooperative also needs to strike a balance between serving members in their current activities and branching out into new activities if that is necessary to preserve the cooperative's ability to continue serving the majority of its patron-owners.

When the membership of the cooperative is heterogeneous, the cooperative also needs to balance benefits among the various members to preserve the stability of the organization. For example, the game-theoretic analyses demonstrate that in some instances differential pricing of goods and services to members is necessary to prevent those with better market opportunities from abandoning the cooperative, which could leave the remaining members worse off. Game theory also offers some guidelines on how such differential pricing ought to be structured.

Exactly where the balance should be struck between these various objectives will vary by cooperative, depending on its structure, the type of membership it serves, the goods and services it provides, and the market environment in which it operates. Striking such balances is one of the key responsibilities of the board of directors in setting policy for the cooperative.

Cooperative Finance

The nature of the patron-owner relationship has important implications for cooperative finance. Restricting ownership to patrons limits the potential pool of equity capital for cooperatives as well as management's options for tapping it. The patron-owner relationship also restricts the emergence of secondary markets for cooperative stock, which may lead to more risk-averse behavior on the part of cooperatives, a tendency for members to underinvest in the organization, and more scope for management to pursue its own goals. To attenuate these problems, theory suggests that cooperatives need to establish reliable equity retirement programs and explore new financing options. Such options need to be examined carefully, however, as there is a danger that some may compromise the basic cooperative nature of the organization.

Theory also suggests that because cooperatives lack a fluctuating price on their equity certificates, which in IOF's serves as an important indicator of management performance, the boards of directors of cooperatives need to be more attentive than their IOF counterparts in monitoring the performance of management. In this sense, the tradition of member control in cooperatives represents a structural necessity, not just an ideological preference. Ensuring member control presents a challenge, particularly in large cooperatives, where the complexity of the cooperative's business and the transaction costs to individual members of interacting with the board and management may insulate management from effective member control. Hence, there is a theoretical justification for greater use in such cooperatives of member committees and strong education programs for board members and owner-patrons.

Improving System Coordination

The recent theoretical work also suggests that potential exists for improving the performance of the entire cooperative system, not just of individual cooperatives. For example, in some cases there is theoretical justification for more collaboration and less competition among cooperatives. Such collaboration, which could take the form of joint ventures, consolidations, or mergers, could reduce total system costs and improve returns to farmers. Both game-theoretic analysis and common observation, however, indicate that several factors may work to block such collaboration, such as the vested interests of current managers, patron-owners, and board members and the belief by some members that competition is the only effective means of ensuring some control over management. Hence, any movement toward greater collaboration among cooperatives will have to address these issues.

The game-theoretic analysis suggests that in some circumstances cooperative members would be better off taking collective action via the cooperative, but that incentives exist for them to behave independently, acting as free riders. Examples include the reluctance of members to enter into binding contracts that would lead to economies in input supply and the lack of patron commitment to a cooperative that is acting as a competitive yardstick. Theory suggests that to capture the potential for improved coordination, cooperatives need to develop mechanisms to increase commitment, such as contracts between cooperatives and their

members (including contracts between locals and regionals) that have significant penalties for nonperformance. The need for increased commitment is likely to be particularly important in federated systems, where locals may act independently of their regionals. The danger, however, in increasing the costs to members of not patronizing their cooperatives is that such action may remove the threat of competition (the loss of patronage) as a tool for ensuring good performance by management and the board. Therefore, theory also suggests that the development of mechanisms to increase member commitment needs to be coupled with actions aimed at strengthening member control. The current discussion in several federated cooperatives of moving toward more of a hybrid system, combining the commitment of a centralized cooperative with the grassroots control of a federated structure, represents an attempt to strike such a balance.

Public Policy Toward Cooperatives

The recent theoretical research reaffirms that there are often valid justifications for public policies to support farmer cooperatives, particularly because of their effects on competition in highly concentrated markets and their potential to improve economic coordination. This work thus reinforces the earlier analyses by authors such as Helmberger, but does so for a broader range of market structures than the previous analyses. The recent work, however, also cautions that the public should not grant *carte blanche* to cooperatives. Certain types of cooperative structures (for example, Rhodes' "hunter cooperative") may behave similarly to an IOF conglomerate. There is also theoretical justification for restrictions on the volume of business cooperatives may conduct with nonmembers and still legally qualify as a cooperative. Unrestricted member business can undermine the basic nature of a cooperative.

Theory suggests that two structural characteristics of a cooperative may be particularly important when evaluating its impact on market performance. First, does the cooperative follow an open- or closed-membership policy? All theoretical analyses since the 1950's have shown that it is extremely difficult for even very large cooperatives to exert monopoly power if they do not restrict membership. Second, how extensively does the cooperative rely on unallocated retained earnings? Unallocated reserves represent a pool of "unowned" capital that management can use for its own ends, and heavy reliance on them could allow even an

openmembership cooperative to exert market power. Such market power would arise because net margins earned in one activity would not necessarily flow back to members engaged in that activity to encourage greater supply response. While some use of unallocated reserves may be necessary to give the cooperative flexibility in financing its operations, heavy reliance on such reserves may undermine the cooperative nature of the organization.

Implications for Future Research

Conflicts remain in the theory of farmer cooperation. The most obvious is between the work of those authors who continue to model the cooperative as a firm that maximizes a single objective and much of the other recent theoretical writings that view cooperatives as organizations composed of many individuals, each pursuing his or her own goals. The “cooperative as a firm” models have proved useful for certain types of market structure analyses and have the advantage of generating determinate outcomes. However, they are of little use in addressing many of the issues of group choice facing cooperative participants, and to date they have usually continued to assume perfect knowledge, although Cotterill has begun to incorporate decisionmaking under uncertainty into his analysis of cooperative finance.

Recent theoretical work that pictures the cooperative as a nexus of contracts or as a coalition yields a number of new conclusions and hypotheses about the behavior and performance of farmer cooperatives, but often the conclusions are not fully determinate. For example, the game-theoretic work concludes that to avoid inducing defections from the cooperative, financing rules must lie within the “core” of the game, but often several rules meet this criterion. The models cannot predict which of these rules will be chosen. Similarly, the work based on transaction-cost economics suggests that cooperatives can improve economic coordination in a number of situations; whether cooperatives do in fact improve coordination depends on the specific operating procedures adopted by the cooperatives, which the theory does not predict.

At least two specific areas in cooperative theory merit further analysis. The first involves modeling the behavior of various forms of joint ventures between cooperatives and IOF's. In response to the difficulties cooperatives face in raising equity capital, cooperatives are increasingly exploring joint ventures with IOF's or creating IOF subsidiaries that are partially or wholly

owned by the cooperatives. Many in the cooperative community are concerned that such undertakings violate the very nature of cooperatives and raise important public policy questions. For example, should a cooperative operating a joint venture with an IOF be able to finance those activities with loans from the Bank for Cooperatives? To address these questions, analysts need models and theories that predict how such cooperative-IOF joint ventures and for-profit subsidiaries owned by cooperatives are likely to behave in the market. For example, how is the behavior of a for-profit subsidiary of a cooperative likely to differ from that of a cooperative directly involved in the same activities?

American industry is facing increasing levels of concentration and conglomeration. Because of these, a second area that warrants further theoretical work is how to arrange greater cooperation among cooperatives and between cooperatives and their patrons to counterbalance the market power of large IOF's in certain segments of the economy. In some areas, it is not clear that cooperatives, as presently structured, can compete in the shortrun with the “deep pockets” of conglomerate firms. Yet the long-term consequences of having no cooperatives in these markets might be severe.

Theoretical work is by its nature hypothesis-generating rather than hypothesis-testing. While there are still many fruitful areas for further work in cooperative theory in addition to those outlined above, such as more fully incorporating uncertainty into the “cooperative as a firm” models, perhaps the most promising current area for researchers is to begin testing some of the hypotheses flowing out of the recent theoretical work. For example, does evidence suggest that the “horizon problem” predicted by agency theory is in fact a serious problem? Why are some of the seemingly large opportunities for cooperatives to improve economic coordination that are predicted by theory being missed? There are ample opportunities to keep cooperative researchers busy for some time to come.

Notes

1. Some of the material presented here appeared in abbreviated fashion in Staatz (1987c).

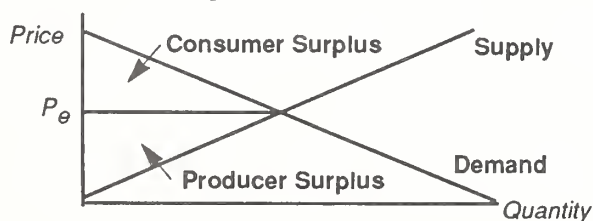
2. For more comprehensive surveys of the theoretical literature on cooperatives prior to 1980 see Vitaliano (1976); Helmberger, Campbell, and Dobson (pp. 556-62); LeVay; Staatz (1984, pp. 9-57); and Sexton (1984a, pp. 50-103).

3. For an introduction to the theory of consumer cooperatives, see Enke. Classic works on the theory of the labor-managed firm include Domar, Vanek, and Ward. Domar's model is almost completely analogous to Helmberger and Hoos' model of an agricultural marketing cooperative. For recent analyses of the theory of agricultural production cooperatives, see McGregor; Guttman and Haruvi; and the references contained in those works.

4. This became known as the debate over the "cooperative maximand." For a detailed discussion, see Cotterill, pp. 182-212; Bateman, Edwards, and LeVay; and Rhodes (1983), pp. 1092-93.

5. The fixed investments are indicated by the U-shaped average cost curve in figure 1. (In economic jargon, the cooperative is operating in the "short run.") In the long run, all factors of production can be varied, leading to an average cost curve that is horizontal.

6. Economists define *producer surplus* as the total returns a producer receives for a good or service minus the variable costs of production. In the figure, producer surplus is represented as the area above the firm's supply curve but below the price. *Consumer surplus* is defined as the well-being (utility) a consumer receives from a good or service minus the value to the consumer (in terms of well-being) of the money spent on the good or service. Hence, if a consumer would be willing to pay more for a good than the actual market price, that person receives a positive amount of consumer surplus when buying the good. In the figure below, consumer surplus is represented by the area below the demand curve but above the price.



7. Rhodes (1983, pp. 1092-93) has expressed doubt that in reality a cooperative earning a substantial unit net margin, as would occur at point B, would allow members to expand patronage to point C. He points out that expanding beyond point B involves "overloading" the cooperative's facilities—that is, accepting so much patronage that the cooperative is operating well beyond its point of minimum unit cost. Rhodes argues that while the problem of overloading may arise in marketing cooperatives that contract to accept all that their members deliver, "many marketing cooperatives and presumably all supply cooperatives have no such obligations. It is difficult to imagine a modern regional cooperative that would allow shortrun overloading to eliminate its earnings, given that the cooperative has no such contractual obligation and there are alternative market outlets or supply sources for producers" (p. 1092). The ability to resist overloading requires, of course, that the management and the board refuse member demands for increased patronage in the short run, possibly expanding plant size in the long run to accommodate more business. Such overloading would also be less likely if patronage refunds are issued primarily in the form of allocated equities that are redeemed only after a long period. In this situation, the patron is likely to regard the patronage refund, when it is finally redeemed for cash, as a windfall gain rather than part of the original price.

8. Assuming that the expanded production by the cooperative did not lead to a lower price for its processed product.

9. Helmberger and Hoos' analysis assumed that each member-firm was currently producing at its profit-maximizing point and hence had no incentive to increase its individual patronage with the cooperative. If this were not the case, the argument would also apply to the question of when it would be in the collective interest of the cooperative's members to allow individual members to expand their patronage with the cooperative. If such expansion led to increasing marginal costs for the cooperative, the membership as a whole would have an economic interest in limiting the amount of business individuals could carry out with the cooperative (for example, by establishing tonnage contracts). The problem in establishing such limits is that it is often politically impossible in the cooperative, for while it may be in the *collective* interest to limit patronage, many individual members have incentives to expand their patronage, and hence they pressure the

board to oppose any such limits.

10. An alternative interpretation is that the raw-product price shown in figure 2 is the price net of the patronage refund. In this case, the manager would not have to know the cooperative's net revenue function in advance. But for the members to have a well-defined supply curve in terms of this net price, they would have to know in advance what their patronage refund would be, which is equivalent to saying that the members would have to know in advance the cooperative's net revenue function.

11. Particularly significant was an ACS-supported "Cooperative Theory Project," which funded research at the University of Missouri, Virginia Polytechnic Institute and State University, the University of Connecticut, and Michigan State University. The research by Rhodes, Condon, Vitaliano, Cotterill, Shaffer, and Staatz discussed in this report was supported by this project.

12. A potential problem arises, however, if the cooperative makes an investment that simply leads all firms in the market to offer farmers more favorable prices but does not increase the cooperative's net margins. Farmers then have an incentive to act as "free riders," benefiting from the lower prices offered by the cooperative's competitors but not bearing any of the cost of supporting the cooperative that made those lower prices possible. This type of free-rider problem and how to address it have been analyzed by theorists who view the cooperative as a coalition.

13. An equilibrium is a situation in which no member has an incentive to change his or her level of patronage with the cooperative. Cotterill presents his analysis for both a supply cooperative, such as shown in figure 1, and a marketing cooperative, while Lopez and Spreen present graphical analysis only for a marketing cooperative. The issues discussed for the marketing cooperative are completely analogous to those raised for the supply cooperative, although the graphs differ. Due to space limitations, only the graph for the supply cooperative is presented here. One can apply figure 1 to the case of a marketing cooperative by simply interpreting it as showing the demand for and costs of supplying marketing services to members. For a critique of the argument presented here, see the discussion of Rhodes' work in note 7.

14. A prisoner's dilemma is a situation in which a group of people's "rational" pursuit of individual self-interest leaves every member of the group worse off than they would have had been had they worked together. This particular prisoner's dilemma in cooperatives was first discussed by Kaarlehto in 1955. A more general discussion of prisoner's dilemmas in cooperatives appears in the section on the cooperative as a coalition. For more details, see Shubik or Staatz, 1987b.

15. Assuming that the market for the final product is effectively competitive.

16. In this situation, potential new members would be better off forming their own cooperative if they could operate it at an average unit cost lower than that which the old cooperative would experience with an expanded membership.

17. Murray (1983b) has analyzed other reasons why managers may prefer to use unallocated reserves. Such reserves give managers considerable flexibility in dealing with unforeseen financial crises and in keeping disaffected groups of members within the cooperative. When a group of members threatens to leave because it feels it is being treated poorly relative to other members, managers may use unallocated reserves to offer them incentives (for example, in terms of better prices) to stay in the organization.

18. Even in those instances where cooperatives allow equity certificates to be traded among members, the potential market for voting stock is very limited compared with that for the common stock of publicly held corporations because in a cooperative ownership is restricted to patrons. Furthermore, within cooperatives there are generally strict limitations on sales of equities that carry voting rights, such as common stock and membership certificates, compared with equities that do not carry voting rights (Cobia et al., pp. 57-63).

19. The threat of a hostile takeover arises when a group of outside investors believe that poor performance by the current management has lowered the firm's stock price below that which is justified by the firm's long-term earnings potential. The outside investors therefore bid for a controlling share of the firm, with the aim of installing a more able management team and thereby benefiting from the appreciation in the value of the stock.

20. The horizon problem does not arise in IOF's because IOF stock confers a residual claim on the earnings of that firm *in perpetuity*. A well-functioning secondary market for the IOF stock will therefore value it in terms of the expected present value of the firm's future earnings. Stockholders can realize the capitalized value of those future earnings at any time by selling the stock.

21. Intergenerational transfer of ownership can be facilitated if the member-farm firms are legally incorporated and the corporation, rather than the individual proprietors, are the members of the cooperative.

22. ACS is currently funding empirical research on these issues at Michigan State University. For example, see Haydu.

23. Technically, the models assume that the frequency distribution of the members' preferences regarding a particular issue has a single peak, as in a bell-shaped curve.

24. Basic introductions to game theory include Shubik and Luce and Raiffa. Howard Raiffa, in *The Art and Science of Negotiation*, presents an insightful and extremely readable account of how ideas from game theory can help in everyday decisionmaking. Staats (1984, Appendix B) presents basic elements of game theory useful in modeling cooperatives' behavior.

25. The prisoner's dilemma was first described by Luce and Raiffa (pp. 94-102), who developed the following story to illustrate the situation. The police arrest two men suspected of burglarizing a home, but lack the evidence to convict them without one of them confessing. The district attorney puts the prisoners in two separate rooms and offers each the following deal, letting each know that his accomplice has been offered the same proposition. If neither confesses, the DA has enough evidence to convict them both on a trumped-up charge of disturbing the peace, for which they will each be sentenced to a year in jail. If one confesses and turns state's evidence while his compatriot does not, the one who confesses will go free while his partner will have the book thrown at him and will likely be sentenced to 6 years in prison. If both confess, the prosecution will be more lenient and ask that each be sentenced to 4 years.

The payoffs to the two prisoners from following different strategies are summarized in the matrix, which

shows the number of years each player can expect to spend in jail depending on what both he and his partner do. For example, if prisoner A does not confess while prisoner B does, prisoner A will spend 6 years in jail while prisoner B goes free. This is indicated by the ordered pair (6,0) in the northeast corner of the matrix.

Payoffs (years in jail) in a Prisoner's Dilemma

		Prisoner B	
		Not Confess	Confess
Prisoner A	Not Confess	(1,1)	(6,0)
	Confess	(0,6)	(4,4)

No matter what strategy prisoner B follows, prisoner A is always better off confessing. If B refuses to confess, A can escape all punishment by confessing and turning state's evidence. If B confesses, A will be jailed for 6 years if he doesn't confess but only 4 years if he does. The same logic applies to prisoner B. If the prisoners could communicate and make binding commitments to each other, then the best mutual strategy would be for them both not to confess. Lacking the ability to make such deals, each has an individual incentive to confess, even though he realizes that his partner has the same incentive and that if both confess, they will both be worse off than if they both refused to deal with the DA. This dilemma illustrates the occasional difficulty in game-theoretic situations of unambiguously defining "rational behavior." Here, rational individual behavior leads to a mutually less preferred outcome.

26. For example, the behavior of the prisoners described in the previous footnote would likely be different if they believed their behavior in the current "game" would affect not only the amount of time they would spend in jail but also their payoffs from subsequent games (for example, the possibility of being gunned down by their partner's brother for "being a rat").

27. See the discussion of the "horizon problem" earlier in this paper.

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Agricultural Cooperative Service (ACS) provides research, management, and educational assistance to cooperatives to strengthen the economic position of farmers and other rural residents. It works directly with cooperative leaders and Federal and State agencies to improve organization, leadership, and operation of cooperatives and to give guidance to further development.

The agency (1) helps farmers and other rural residents develop cooperatives to obtain supplies and services at lower cost and to get better prices for products they sell; (2) advises rural residents on developing existing resources through cooperative action to enhance rural living; (3) helps cooperatives improve services and operating efficiency; (4) informs members, directors, employees, and the public on how cooperatives work and benefit their members and their communities; and (5) encourages international cooperative programs.

ACS publishes research and educational materials and issues *Farmer Cooperatives* magazine. All programs and activities are conducted on a nondiscriminatory basis, without regard to race, creed, color, sex, age, marital status, handicap, or national origin.